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SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 30 (1)

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Use of funds for printing this publication approved by the Director of the Office of Management and Budget, March 3, 1976.

AQUATIC PLANTS AND THEIR CONTROL

85-000001 Mitchell, C. P.; G. R. Fish and A. M. R. Burnet. LIMNOLOGICAL CHANGES IN A SMALL LAKE STOCKED WITH GRASS CARP. *N. Z. J. Mar. Freshwater Res.* 18(2):103-114. 1984. SFA 30(1)

[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 951, Rotorua, New Zealand] A heavy infestation of aquatic weeds (*Egeria densa* and *Eleocharis sphacelata*) in a 1.92 ha lake (Parkinsons Lake, North Island, New Zealand) disappeared within 2 years of the introduction of Chinese grass carp (*Ctenopharyngodon idella* Val). The elimination of aquatic plants did not result in any significant change in dissolved oxygen, water temperature, or annual fluctuations in lake levels over the successive 2 years. Dissolved inorganic phosphorus concentrations did not increase appreciably although there was a short term rise in particulate phosphorus levels. Oxidised nitrogen fluctuations were small in the lake over the experimental period. Some reduction in water transparency occurred although chlorophyll a levels showed no overall increase. There were increases in zooplankton numbers and biomass. A large increase of ammonium nitrogen in the lake accrued 12 months after all macrophytes had been eliminated, this possibly was a result of heavy use of inshore water by cattle.

85-000002 Rowe, D. K. SOME EFFECTS OF EUTROPHICATION AND THE REMOVAL OF AQUATIC PLANTS BY GRASS CARP (*CTENOPHARYNGODON IDELLA*) ON RAINBOW TROUT (*SALMO GAIIRDNERII*) IN LAKE PARKINSON, NEW ZEALAND. *N. Z. J. Mar. Freshwater Res.* 18(2):115-127. 1984. SFA 30(1)

[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 951, Rotorua, New Zealand] Temporary removal of aquatic plants in Lake Parkinson, a small, eutrophic dune lake, resulted in a number of changes to the population of stocked rainbow trout (*Salmo gairdnerii*). During each summer the lake stratified and low oxygen levels limited the distribution of trout to shallow (0-4 m) surface waters. In the first summer following weed removal the numbers of black shags (*Phallacrocorax carbo*) counted at the lake increased, and their predation resulted in a decline in trout density. However, the growth rate and condition of the trout then exceeded that of trout present before weed removal. During the second summer after weed removal a cladoceran bloom was followed by low phytoplankton levels and high ammonia concentrations. A prolonged calm compounded this situation with the result that oxygen levels in bottom and surface waters dropped below 2 ppm. These low oxygen levels eliminated the trout population, but other fish species present survived. Elimination of aquatic plants affected the population dynamics of other fish species in the lake with potential implications for the trout. The experiment demonstrated the importance of weed beds in maintaining a stable fish community in lakes such as Lake Parkinson.

GENERAL FISH CULTURE

85-000003 Banerjee, R. K. and G. N. Chattopadhyay. METHODOLOGY FOR SOIL AND WATER ANALYSES IN BRACKISHWATER CULTURE SYSTEM. *Cent. Inland Fish. Res. Inst. Misc. Contrib.* No. 15. 20p. 1980. SFA 30(1)

[Cent. Inland Fish. Res. Inst., Barrackpore 743101, West Bengal, India]

85-000004 Jana, B. B. and G. N. Patel. SPATIAL AND SEASONAL VARIATIONS OF PHOSPHATE SOLUBILIZING BACTERIA IN FISH PONDS OF VARYING FISH FARMING MANagements. *Arch. Hydrobiol.* 101(4):555-568. 1984. SFA 30(1)

[Dep. Zool., Univ. Kalyani, Kalyani 741235, West Bengal, India]

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GENERAL FISH CULTURE (CONTINUED)

85-000005 Opuszynski, K.; J. V. Shireman; F. J. Aldridge and R. W. Rottmann. ENVIRONMENTAL MANIPULATION TO STIMULATE ROTIFERS IN FISH REARING PONDS. *Aquaculture* 42(3-4):343-348. 1984. SFA 30(1)
[Sch. For. Resour. Conserv., Univ. Fla, Gainesville]

85-000006 Scott, K. R. and L. Allard. A FOUR-TANK WATER RECIRCULATION SYSTEM WITH A HYDROCYCLONE PREFILTER AND A SINGLE WATER RECONDITIONING UNIT. *Prog. Fish-Cult.* 46(4):254-261. 1984. SFA 30(1)
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB, Canada]

85-000007 Soderberg, R. W.; M. V. McGee; J. M. Grizzle and C. E. Boyd. COMPARATIVE HISTOLOGY OF RAINBOW TROUT AND CHANNEL CATFISH GROWN IN INTENSIVE STATIC WATER AQUACULTURE. *Prog. Fish-Cult.* 46(3):195-199. 1984. SFA 30(1)
[Fish Cult. Prog., Biol. Dep., Mansfield Univ., Mansfield, PA 16933]

85-000008 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR FISCAL YEAR 1983. *U.S. Fish Wildl. Serv. Fish. Dist. Rep.* 18. 70p. 1984. SFA 30(1)
[Washington, DC]

TROUT AND SALMON CULTURE

85-000009 Goncharov, B. F. A SYNTHETIC ANALOG OF LULIBERIN AS A NEW AND PROMISING STIMULATOR OF MATURATION OF SEXUAL PRODUCTS OF STURGEONS. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 276(1-6):388-391. 1984. SFA 30(1)
[N.K. Kol'tsov Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]

85-000010 Ridler, N. B. SOCIOECONOMIC ASPECTS OF SEA CAGE SALMON FARMING IN THE MARITIMES. *Can. J. Fish. Aquatic Sci.* 41(10):1490-1495. 1984. In English with French summ. SFA 30(1)
[Univ. New Brunswick, P.O. Box 50501, Saint John, NB E2L 4L5, Canada]

85-000011 Solar, I. I.; E. M. Donaldson and G. A. Hunter. OPTIMIZATION OF TREATMENT REGIMES FOR CONTROLLED SEX DIFFERENTIATION AND STERILIZATION IN WILD RAINBOW TROUT (*SALMO GAIARDNERI* RICHARDSON) BY ORAL ADMINISTRATION OF 17 α -METHYLTESTOSTERONE. *Aquaculture* 42(2):129-139. 1984. SFA 30(1)
[Mar. Resour. Br., Minist. Environ., Victoria, BC, Canada] The oral administration of 17 α -methyltestosterone (MT) to wild rainbow trout fry at concentrations ranging from 1 to 100 mg/kg diet for periods up to 120 days following swim-up produced male-female ratios substantially different from controls. 100% males were produced with low MT doses (1, 3 and 9 mg/kg diet) administered for 60 days. High proportions (79-90%) of sterile rainbow trout were obtained with greater doses of the steroid (25, 50 and 100 mg/kg diet) fed for 120 days. A paradoxical feminizing effect at high doses of MT (50 and 100 mg/kg diet) was observed irrespective of the length of the treatment. No dose-related mortality during the treatments was observed.

SPORT FISHERY ABSTRACTS

TROUT AND SALMON CULTURE (CONTINUED)

85-000012 Sutterlin, A. M.; C. Y. Couturier and T. Devereaux. A RECIRCULATION SYSTEM USING OZONE FOR THE CULTURE OF ATLANTIC SALMON. *Prog. Fish-Cult.* 46(4):239-244. 1984. SFA 30(1)

[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

85-000013 Taylor, S. G. QUALITY OF PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) FRY INCUBATED FROM EGGS IN RIVER GRAVEL OR PLASTIC SUBSTRATES. *Aquaculture* 42(3-4):359-365. 1984. SFA 30(1)

[NMFS, P.O. Box 210155, Auke Bay, AK 99821] Pink salmon (*Oncorhynchus gorbuscha*) eggs were incubated to the emergent-fry stage in separate incubators containing either river gravel or one of four plastic substrates (2.5-cm saddles, 2.5-cm rings, 3.7-cm rings, and a 1:1 mixture of 2.5-cm and 3.7-cm rings). Length, weight, stage of development, and survival from egg to emergent fry were similar for fry from all incubators, regardless of substrate. Significantly more fry emerged prematurely (i.e. had open ventral slits) from incubators with plastic substrates (10%) than from incubators with gravel substrates (3%); however, fully developed fry emerged an average of 3 days later from plastic substrates than from gravel substrates.

85-000014 Volkov, I. V.; Y. V. Kostylev; N. A. Kontsova and S. P. Abukov. ECOLOGICAL IMPORTANCE OF FUNCTIONAL CONDITION IN SALMON, *SALMO SALAR* (SALMONIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(1):154-157. 1984. SFA 30(1)

[SevrybNIIproekt, Petrozavodsk, USSR]

OTHER ANADROMOUS SPECIES CULTURE

85-000015 Degani, G. and D. Levanon. INFLUENCE OF SHAPES OF INDOOR AND OUTDOOR CONTAINERS ON ADAPTATION TO ARTIFICIAL FOOD, GROWTH AND SURVIVAL OF ELVERS. *Prog. Fish-Cult.* 46(3):191-194. 1984. SFA 30(1)

[Migal-Galilee Technol. Cent., Kiryat Shmona, Israel]

85-000016 Gallagher, M. L. A METHOD FOR THE SIZE SEPARATION OF ELVERS. *Prog. Fish-Cult.* 46(2):157-158. 1984. SFA 30(1)

[Inst. Coastal Mar. Resour., Sch. Home Econ., East Carolina Univ., Greenville, NC 27834]

85-000017 McCraven, J. P. THE AQUACULTURE OF STRIPED BASS: A PROCEEDINGS. *Univ. Md. Sea Grant Prog.* 262p. 1984. Available for \$5.00 from Univ. Md. Sea Grant Prog., 1224 Patteron Hall, Univ. Md., College Park 20742. SFA 30(1)

85-000018 Wiggins, T. A.; T. R. Bender, Jr.; V. A. Mudrak and J. R. Kremmel. THE INFLUENCE OF ROLLING ON THE HATCH OF AMERICAN SHAD EGGS. *Prog. Fish-Cult.* 46(1):51-52. 1984. SFA 30(1)

[Pa. Fish. Comm., Benner Spring Fish Res. Stn., Bellefonte, PA 16823]

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WARMWATER CULTURE

85-000019 Bowling, C. W.; W. P. Rutledge and J. G. Geiger. EVALUATION OF RYEGRASS COVER CROPS IN REARING PONDS FOR FLORIDA LARGEMOUTH BASS. *Prog. Fish-Cult.* 46(1):55-57. 1984. SFA 30(1)

[Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744]

85-000020 Boyd, C. E.; W. D. Hollerman; J. A. Plumb and M. Saeed. EFFECT OF TREATMENT WITH A COMMERCIAL BACTERIAL SUSPENSION ON WATER QUALITY IN CHANNEL CATFISH PONDS. *Prog. Fish-Cult.* 46(1):36-40. 1984. SFA 30(1)

[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849]

85-000021 Espinach Ros, A.; A. Fortuny and V. G. Amutio. INDUCED BREEDING OF THE SABALO, *PROCHILODUS PLATENSIS* HOLMBERG. *Aquaculture* 41(4):385-388. 1984. SFA 30(1)

[Inst. Nac. Invest. Desar. Pesq., Playa Grande (7600) Mar de Plata, Argentina] Maturation and ovulation were induced in female *Prochilodus platensis* with multiple homologous pituitary extract injections (total dose 0.9 to 1.4 hypophysis/kg) or single injections of pituitary extract combined with human chorionic gonadotrophin [(1 hypophysis + 500 I.U.)/kg]. One of the females given the latter treatment produced viable eggs. Latency time from injection to ovulation was 9 h (at 28°C). Hatching occurred 12 h after fertilization. Survival after 30 days of rearing was 96%.

85-000022 Galasun, P. T.; A. E. Andryushchenko and V. V. Grusevich. BIOLOGICAL PRINCIPLES OF INTRODUCING NEW SPECIES FOR AQUACULTURE (*ICTALURUS PUNCTATUS* AND *ICTIOBUS CYPRINELLUS*) INTO UKRAINIAN WATERS. *Aquaculture* 42(3-4):333-342. 1984. SFA 30(1)

[Ukrainian Res. Inst. Fish., Obuhoskaja 135, 252164 Kiev, USSR]

85-000023 Hårrell, R. M. TANK SPAWNING OF FIRST GENERATION STRIPED BASS X WHITE BASS HYBRIDS. *Prog. Fish-Cult.* 46(2):75-78. 1984. SFA 30(1)

[Rembert C. Dennis Wildl. Cent., Bonneau, SC 29431]

85-000024 Hodgkinson, P. BREEDING GOLDFISH. *Trop. Fish Hobbyist* 33(4):10-26. 1984. SFA 30(1)

85-000025 Knyazev, I. V. ACCLIMATIZATION OF YOUNG COMMON CARP, *CYPRINUS CARPIO* (CYPRINIDAE), IN GEOTHERMAL SALINE WATER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(1):158-161. 1984. SFA 30(1)

[SibrybNIIproekt, Tyumen', USSR]

85-000026 Macintosh, D. J. and S. S. De Silva. THE INFLUENCE OF STOCKING DENSITY AND FOOD RATION ON FRY SURVIVAL AND GROWTH IN *OREOCHROMIS MOSSAMBICUS* AND *O. NILOTICUS* FEMALE X *O. AUREUS* MALE HYBRIDS REARED IN A CLOSED CIRCULATED SYSTEM. *Aquaculture* 41(4):345-358. 1984. SFA 30(1)

[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland]

WARMWATER CULTURE (CONTINUED)

85-000027 Morawska, B. THE EFFECT OF WATER TEMPERATURE ELEVATION ON INCIPIENT AND CUMULATIVE FECUNDITY OF BATCH-SPAWNING TENCH, *TINCA TINCA* (L.). *Aquaculture* 42(3-4):273-288. 1984. SFA 30(1)

[Inland Fish. Inst., Heated Water Lab., ul. Augustowska 1, 02-981 Warsaw, Poland] The fecundity of 131 tench (*Tinca tinca* L.) from heated and control ponds was evaluated in the years 1974, 1975 and 1977. There were differences in the temperature of both types of pond and these varied with the season and also with the year. The reproductive season began 1 month earlier in the heated ponds, but it ended almost simultaneously in the two types of pond. In the control ponds tench deposited 3-4 batches of spawn during the season, and in the heated ones 5-8 batches. There were significant differences in fecundity between successive batches during the season, for the population of the heated ponds. Heating the water did not change mean batch fecundity which varied between 38×10^3 and 52×10^3 oocytes. Incipient fecundity (number of oocytes before first spawning) was also similar in both types of pond. The cumulative fecundity (the total number of oocytes deposited by the average female over the reproductive season) of females from the heated ponds was on average higher by 38.6-91.8%. Temperature patterns over the prespawning and spawning period exerted a determining effect on the number and fecundity of the successive batches and on cumulative fecundity during the season.

85-000028 Mustafa, S.; Z. Ahmad; A. Murad and S. M. Zofair. INDUCED SPAWNING OF CATFISH BY FROG PITUITARY GONADOTROPINS. *Prog. Fish-Cult.* 46(1):43-44. 1984. SFA 30(1)

[Div. Ichthyol. Fish., Dep. Zool., Aligarh Muslim Univ., Aligarh-202 001, India]

85-000029 Paessun, M. A. and R. Allison. MAXIMIZING TILAPIA PRODUCTION IN RECIRCULATING SYSTEMS BY SEQUENTIAL REARING. *Aquaculture* 42(2):185-189. 1984. SFA 30(1)

[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849] A solar-heated greenhouse containing recirculating fish production systems was used to culture *Tilapia nilotica* and *T. aurea*. Fish production was maximized by sequential rearing, grading, and restocking of fish at high densities to utilize each system fully. Marketable-size (167 g) fish were produced from 29-g fingerlings in 137 days. No reproduction was recorded. Spawning in February was induced naturally by a 16L/8D photoperiod, water temperature of 24°C, and reducing stock density.

85-000030 Pessoney, G. F.; H. G. Leggett; R. T. van Aller and V. A. Rogers. ALGAL ABUNDANCE AND DIVERSITY IN MANAGED CATFISH PONDS. *Am. Zool.* 24(3):28A. 1984. Abstract only. SFA 30(1)

[Univ. South. Miss., Hattiesburg]

85-000031 Rice, T.; D. H. Buck; R. W. Gorden and P. P. Tazik. MICROBIAL PATHOGENS AND HUMAN PARASITES IN AN ANIMAL WASTE POLY CULTURE SYSTEM. *Prog. Fish-Cult.* 46(4):230-238. 1984. SFA 30(1)

[Aquatic Biol. Sect., Ill. Nat. Hist. Surv., 607 E. Peabody, Champaign, IL 61820]

85-000032 Rowland, S. J. THE HORMONE-INDUCED SPAWNING OF SILVER PERCH, *BIDYANUS BIDYANUS* (MITCHELL) (TERAPONIDAE). *Aquaculture* 42(1):83-86. 1984. SFA 30(1)

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WARMWATER CULTURE (CONTINUED)

85-000032 CONTINUED

[Agric. Res. Advis. Stn., Grafton, N.S.W. 2460, Australia] Adult silver perch, *Bidyanus bidyanus*, were induced to spawn by the injection of human chorionic gonadotrophin (HCG) or a preparation of the pituitary gland from common carp (CPG). Males, injected with 200 IU/kg HCG, were placed with injected females in 2000-l concrete tanks, and spawning occurred 31-40 h after injection at a water temperature of 25°C. All females injected with 200 IU/kg HCG spawned completely, and the mean hatch rate of eggs was 88.8%. Higher dosages of HCG, and the use of CPG, resulted in reduced spawning success and, in general, lower mean hatch rates. Techniques for egg incubation are briefly described.

85-000033 Schramm, H. L., Jr.; B. French and M. Ednoff. DEPREDAATION OF CHANNEL CATFISH BY FLORIDA DOUBLE-CRESTED CORMORANTS. *Prog. Fish-Cult.* 46(1):41-43. 1984. SFA 30(1)

[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611]

85-000034 Smitherman, R. O.; R. A. Dunham; T. O. Bice and J. L. Horn. REPRODUCTIVE EFFICIENCY IN THE RECIPROCAL PAIRINGS BETWEEN TWO STRAINS OF CHANNEL CATFISH. *Prog. Fish-Cult.* 46(2):106-110. 1984. SFA 30(1)

[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849]

85-000035 Watten, B. J. and R. L. Busch. TROPICAL PRODUCTION OF TILAPIA (*SAROTHERODON AUREA*) AND TOMATOES (*LYCOPERSICON ESCULENTUM*) IN A SMALL-SCALE RECIRCULATING WATER SYSTEM. *Aquaculture* 41(3):271-283. 1984. SFA 30(1)

[Pa. Power Light Co., Brunner Island Aquacult. Proj., P.O. Box 221, York Haven, PA 17370]

85-000036 Zohar, G.; U. Rappaport; Y. Avnimelech and S. Sarig. RESULTS OF THE EXPERIMENTS CARRIED OUT IN THE GENOSAR EXPERIMENTAL STATION IN 1983. CULTIVATION OF TILAPIA IN HIGH DENSITIES AND WITH PERIODIC FLUSHING OF THE POND WATER. *Bamidgeh* 36(3):63-69. 1984. SFA 30(1)

[Genosar Exp. Stn., P.O.B. 33, Tiberias, Israel]

MARICULTURE

85-000037 Crawford, C. M. PRELIMINARY RESULTS OF EXPERIMENTS ON THE REARING OF TASMANIAN FLOUNDERS, *RHOMBOSOLEA TAPIRINA* AND *AMMOTRETIS ROSTRATUS*. *Aquaculture* 42(1):75-81. 1984. SFA 30(1)

[Zool. Dep., James Cook Univ., Townsville, Queensland 4811, Australia] Tasmanian species of flounder were cultured successfully following stripping and fertilizing eggs after hormone-induced ovulation. The larvae were fed rotifers followed by *Artemia* nauplii. Survival rates of larvae from first-feeding to metamorphosis, which were as high as 94-98% for *R. tapirina* and 65% for *A. rostratus*, indicate that both species can be readily cultured in captivity.

85-000038 Kaya, C. M.; M. K. K. Queenth and A. E. Dizon. CAPTURING AND RESTRAINING TECHNIQUE FOR EXPERIMENTAL WORK ON SMALL TUNA IN LARGE LABORATORY HOLDING TANKS. *Prog. Fish-Cult.* 46(4):288-290. 1984. SFA 30(1)

[Dep. Biol., Mont. State Univ., Bozeman 59717]

SPORT FISHERY ABSTRACTS

MARICULTURE (CONTINUED)

85-000039 Sieswerda, P. and D. Policansky. A FLOW-THROUGH SYSTEM FOR REARING FLATFISH THROUGH METAMORPHOSIS. *Prog. Fish-Cult.* 46(1):13-19. 1984. SFA 30(1)
[New England Aquarium, Central Wharf, Boston, MA 02110]

85-000040 Tucker, J. W., Jr. HORMONE-INDUCED OVULATION OF BLACK SEA BASS AND REARING OF LARVAE. *Prog. Fish-Cult.* 46(3):201-203. 1984. SFA 30(1)
[Cent. Mar. Biotechnol., Harbor Branch Inst., Inc., RRL, Box 196A, Fort Pierce, FL 33450]

FEEDS, FEEDING, AND NUTRITION

85-000041 Abel, H. J.; K. Becker; C. H. R. Meske and W. Friedrich. POSSIBILITIES OF USING HEAT-TREATED FULL-FAT SOYBEANS IN CARP FEEDING. *Aquaculture* 42(2):97-108. 1984. SFA 30(1)
[Inst. Tierphysiol. Tierernahrung, Univ. Gottingen, D 3400 Gottingen, West Germany]

85-000042 Barash, H. GROWTH RATES OF YOUNG TILAPIA FINGERLINGS FED ON COMMERCIAL EEL AND TROUT DIETS. *Bamidgeh* 36(3):70-79. 1984. SFA 30(1)
[Inst. Anim. Sci., ARO, Volcani Cent., Bet Dadan, Israel] Young tilapia fingerlings were fed an eel commercial diet from hatching until they reached a weight of 0.8 g. per fish, and one commercial trout starter diet from that weight until 33 g. In one experiment, the F_1 of *Oreochromis niloticus* x *O. aureus* grew from 0.25 g to 0.8 g. per fish at 27°C at a specific growth rate (SGR) of 5.1. In a second experiment the F_1 grew from 0.7 to 32.9 g. per fish at 25°C in 14 weeks. Two growth rates were observed: SGR of 4.2 for the first 10 weeks, and of 3.2 for the next four weeks. In a third experiment red and grey fingerlings, offspring of "Red Tilapia" from Taiwan, were raised separately at 27°C. The red fingerlings grew from 0.8 g to 17.0 g. per fish at SGR of 4.8, and the grey fingerlings grew from 0.9 g. to 29.6 g. per fish at the same SGR of 4.8. In all the experiments, the food conversion ratio was between 2.25 and 1.15 and the growth pattern observed was of a logarithmic mode.

85-000043 Corbari, L.; P. Ghittino; M. Amerio; M. Caggiano and M. Bertolinelli. RICERCA APPLICATA PER LA MESSA A PUNTO DI UNA DIETA BILANCIATA PER LA SPIGOLA (*DICENTRARCHUS LABRAX*). [APPLIED RESEARCH FOR ESTABLISHING A BALANCED DIET FOR SEABASS (*DICENTRARCHUS LABRAX*).] *Riv. Ital. Piscic. Ittiop.* 19(3):95-114. 1984. In Italian with English summ. SFA 30(1)
[Acquacolt. Ital. S.p.A., Via di Casanello, 59-Lecce, Italy]

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[Ga. Power Co., Environ. Affr. Cent., 791 DeKalb Industrial Way, Decatur, GA 30033] Developmental stages of the highfin carpsucker (*Carpiodes velifer*) were described and compared with descriptions of the silver redhorse (*Moxostoma anisurum*), spotted sucker (*Minytrema melanops*), creek chubsucker (*Erimyzon oblongus*), lake chubsucker (*Erimyzon sucetta*), and the quillback carpsucker (*Carpiodes cyprinus*). A taxonomic key was provided for the species exclusive of *Carpiodes cyprinus*. Larvae of *Carpiodes velifer* were separated from *Minytrema melanops* by the lower preanal myomere counts (25 to 29 vs 31 to 35). *Moxostoma anisurum* larvae have higher total and postanal myomere counts (42 to 43 and 29 to 30) compared to *Carpiodes velifer* (32 to 38 and 25 to 29). Pigment patterns were used to separate the larvae of *Erimyzon oblongus* and *Erimyzon sucetta* from *Carpiodes velifer*. Adult characteristics were used to separate juveniles of *Carpiodes velifer* from the other catostomids.

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$$S_t^{0.75} = S_o^{0.75} - (0.00675e^{0.43T}W^{0.43})t$$
after a temperature sensitive delay.
This curve gives an excellent prediction of the

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[Freshwater Fish. Lab., Pitlochry PH16 5LB, Scotland] After a pre-prandial period of starvation or feeding with unlabelled food, 0+ salmon parr (0.8-11.7g) were fed a test meal of iron particle labelled food and subsequently were again either starved or fed unlabelled food. The quantity of labelled food consumed and the evacuation rate was determined by serial radiographs. In fish of all sizes, pre-prandial starvation causes a larger test meal (as a percentage of body weight) to be consumed when compared to pre-prandially fed fish. In addition, pre-prandial starvation results in relatively larger meals as a percentage of body weight being taken by smaller compared to larger fish. This result was not evident for pre-prandially fed fish. Evacuation rate was unrelated to body size irrespective of feeding history. Post-prandial starvation decreased evacuation rate but this effect was inversely related to the quantity of food consumed. Larger meals were not evacuated differently from smaller meals if feeding occurred post-prandially, irrespective of pre-prandial starvation.

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[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] The rotifer *Brachionus plicatilis* and the copepod *Tigriopus californicus* are easily cultured and commonly used as food for larval fishes. Sizes of rotifers, nauplii, and

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[Univ. Tex. Mar. Sci. Inst., Port Aransas 78373] The effects of capture stress, exposure to a hypo-osmotic environment and elevated water temperatures on the ascorbic acid (AsA) content of several mullet, *Mugil cephalus*, tissues were examined. All the treatments significantly altered tissue AsA levels, but the pattern of AsA fluctuations varied. Gill AsA concentrations increased two fold after exposure to a hypo-osmotic medium (salinity changed from 30‰ to 50‰), whereas AsA content in this tissue declined after capture. Both treatments depleted AsA reserves in the kidney. AsA concentrations in the brain increased after exposure to low salinity and elevated water temperatures, but were unaffected by capture stress. None of the treatments caused long term alteration of hepatic AsA reserves. Ascorbic acid inhibited ouabain-sensitive Na^+ , K^+ -ATPase activity of gill tissue *in vitro*. The results suggest an involvement of AsA in osmo- or ion-regulatory functions of teleosts gills, salinity and thermal adaptation mechanisms in neural tissue, and the response of renal tissue to adverse environmental stimuli.

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GENETICS, VARIATION STUDIES AND HYBRIDIZATION

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[Inst. Zool., Acad. Sci. Armenian SSR, Yerevan, USSR] A karyological study was made of the alabalakh trout, which lives exclusively in tributaries of Lake Sevan. The alabalakh is distinct from the Sevan trout and the Armenian brook trout by its karyotype. On the basis of karyological data and consideration of the geological history of the formation of the Sevan basin,

SPORT FISHERY ABSTRACTS

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

85-000379 CONTINUED the alabalakh would seem to be a relict form of *Salmo trutta*, which became secondarily reestablished in the tributaries of Lake Sevan and is genetically distinct from the Sevan trout, *Salmo ischchan*.

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[Dep. Fish. Wildl., Univ. Minn., St. Paul 55108]

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[R. W. G. White: Dep. Zool., Univ. Tasmania, Box 252C G.P.O., Hobart, Tasmania, Australia 7001]

85-000391 Woods, T. D. and D. G. Buth. HIGH LEVEL OF GENE SILENCING IN THE TETRAPLOID GOLDFISH. *Biochem. Syst. Ecol.* 12(4):415-421. 1984. SFA 30(1)

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[Dep. Psychophysiol. Comp., I.N.P., C.N.R.S., 31, chemin Joseph-Aiguiers, F 13274 Marseille Cedex 2, France]

85-000395 Coutant, C. C.; K. L. Zachman; D. K. Cox and B. L. Pearman. TEMPERATURE SELECTION BY JUVENILE STRIPED BASS IN LABORATORY AND FIELD. *Trans. Am. Fish. Soc.* 113(5):666-671. 1984. SFA 30(1)

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85-000396 Devine, M. G. and D. K. Shiozawa. LITTORAL HETEROGENEITY AND DIEL BEHAVIOR OF WHITE BASS (*MORONE CHRYSOPS*) AND CARP (*CYPRINUS CARPIO*) IN UTAH LAKE, UTAH. *Great Basin Nat.* 44(3):509-515. 1984. SFA 30(1)

[5016 50th Ave. NE, Oak Harbor, WA 98277] Diel activity and association patterns of white bass (*Morone chrysops*) and carp (*Cyprinus carpio*) in Utah Lake, Utah, were studied over four 24-hour periods during August, 1980. Fish were concurrently sampled from two adjacent littoral habitats. Significant differences existed in diel activity patterns in two of three size classes of white bass and in diel association patterns of white bass and carp between the two habitat areas. Differences in habitat structure, and in biological activity between the habitat types, are implicated as the primary determinants of overall diel activity of fish in these littoral areas.

85-000397 Dunlap, P. V. PHYSIOLOGICAL AND MORPHOLOGICAL STATE OF THE SYMBIOTIC BACTERIA FROM LIGHT ORGANS OF PONYFISH. *Biol. Bull.* 167(2):410-425. 1984. SFA 30(1)

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[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

85-000401 Greenberg, L. A. HABITAT UTILIZATION BY TWO SPECIES OF STREAM FISHES. *Am. Zool.* 24(3):128A. 1984. Abstract only. SFA 30(1)

[Cornell Univ., Ithaca, NY] The role of interspecific interactions on the spatial distribution of two species of darters, *Etheostoma simoterum*, the Tennessee snubnose darter, and *E. rufilineatum*, the redline darter, was investigated in the Little River of east Tennessee. To test whether either species affected the distribution of the other, both species were selectively removed from plots in run and riffle habitats. The only distributional change occurred for *E. simoterum* in runs. After *E. rufilineatum* was removed, *E. simoterum*'s distribution shifted away from shore. Support for this interaction was obtained by testing the utilization of shelters by each species in artificial streams. When in the presence of conspecific fish, both species showed a strong preference for the shelters. However, when both species were placed together, *E. simoterum* rarely occupied the shelters whereas *E. rufilineatum* showed only a modest decrease in its shelter use. Both field and lab experiments suggest that interspecific competition may be an important determinant of the distributions of stream fishes.

SPORT FISHERY ABSTRACTS

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85-000402 Heiligenberg, W. F. and C. D. Hopkins. ELECTROLOCATION AND ELECTRICAL COMMUNICATION BY GYMNOTOID FISHES FROM COASTAL SURINAM. *Natl. Geogr. Soc. Res. Rep.* 17:461-474. 1984. SFA 30(1)

85-000403 Hoelzer, G. PRELIMINARY OBSERVATIONS ON THE SOCIAL BEHAVIOR OF THE CORTEZ DAMSELFISH (*STEGASTES RECTIFRAENUM*). *Am. Zool.* 24(3):50A. 1984. Abstract only. SFA 30(1)
[Univ. Ariz., Tucson]

85-000404 Kneib, R. T. PATTERNS IN THE UTILIZATION OF THE INTERTIDAL SALT MARSH BY LARVAE AND JUVENILES OF *FUNDULUS HETEROCLITUS* (LINNAEUS) AND *FUNDULUS LUCIAE* (BAIRD). *J. Exp. Mar. Biol. Ecol.* 83(1):41-51. 1984. SFA 30(1)
[Univ. Ga. Mar. Inst., Sapelo Island, GA 31327]

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[A.I. Karayev Inst. Physiol., Ayerbaiddzhan SSR Acad. Sci., Baku, USSR]

85-000406 Legkiy, B. P. and I. K. Popova. DEVELOPMENT OF PHOTOREACTION IN JUVENILE ROACH, *RUTILUS RUTILUS*, AND MINNOW, *PHOXINUS PHOXINUS* (CYPRINIDAE), IN RELATION TO DOWNSTREAM MIGRATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(1):72-79. 1984. SFA 30(1)
[IMEZh, Moscow, USSR]

85-000407 Magnan, P. and G. J. FitzGerald. MECHANISMS RESPONSIBLE FOR THE NICHE SHIFT OF BROOK CHARR, *SALVELINUS FONTINALIS* MITCHILL, WHEN LIVING SYMPATRICALLY WITH CREEK CHUB, *SEMOTILUS ATROMACULATUS* MITCHILL. *Can. J. Zool.* 62(8):1548-1555. 1984. In English with French summ. SFA 30(1)
[Dep. Biol., Univ. Laval, Sainte-Foy, PQ G1K 7P4, Canada] When brook charr, *Salvelinus fontinalis* Mitchill, are in allopatry in oligotrophic Québec lakes, they feed largely on macrobenthic invertebrates. However, when brook charr cooccur with creek chub, *Semotilus atromaculatus* Mitchill, they feed largely on zooplankton. In the present study, laboratory experiments showed that creek chub were more effective than brook charr in searching for hidden, patchily distributed prey. The searching efficiency of an individual chub feeding in a group was improved through social facilitation. In contrast, the high level of intraspecific aggression observed in brook charr prevents the formation of such feeding groups. In the laboratory, brook charr were able to displace creek chub from the food source because of interspecific aggression. Data are presented showing that chub are morphologically better adapted than charr to feed on benthos (subterminal orientation of the mouth and protrusible premaxillae), while the charr are better adapted than chub to feed on zooplankton (gill raker structure). Differences in feeding behaviour, morphology, and relative abundance between these species appear to be important in the observed niche shift of brook charr in nature.

85-000408 McCourt, R. M. and D. A. Thomson. CLEANING BEHAVIOR OF THE JUVENILE PANAMIC SERGEANT MAJOR, *ABUDEFDUF TROSCHELII* (GILL), WITH A RÉSUMÉ OF CLEANING ASSOCIATIONS IN THE GULF OF CALIFORNIA AND

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85-000408 CONTINUED ADJACENT WATERS. *Calif. Fish Game* 70(4):234-239. 1984. SFA 30(1)

[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson 85721]

85-000409 Meffe, G. K. DENSITY-DEPENDENT CANNIBALISM IN THE ENDANGERED SONORAN TOPMINNOW (*POECILIOPSIS OCCIDENTALIS*). *Southwest Nat.* 29(4):500-503. 1984. SFA 30(1)

[Dep. Zool., Ariz. State Univ., Tempe 85287]

85-000410 Quinn, T. P. and J. C. Ogden. FIELD EVIDENCE OF COMPASS ORIENTATION IN MIGRATING JUVENILE GRUNTS (HAEMULIDAE). *J. Exp. Mar. Biol. Ecol.* 81(2):181-192. 1984. SFA 30(1)

[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Juvenile French and white grunts, *Haemulon flavolineatum* (Desmarest) and *H. plumieri* (Lacépède), were captured during their daily migrations between diurnal resting sites on coral patch reefs and nocturnal feeding grounds in seagrass beds. Grunts captured during morning and evening migrations were released on the route and after displacement up to 100 m or 5 km away. Grunts generally moved in the direction which would have taken them back towards their home reef or to their accustomed feeding sites, indicating that familiar landmarks are not essential for orientation. The spatial precision of migration may serve to partition the feeding area most efficiently. The timing of migrations is also very precise, and appears to be adapted to reduce the vulnerability of grunts to predation near their home reef.

85-000411 Rogers, S. C.; D. W. Church; A. H. Weatherley and D. G. Pincock. AN AUTOMATED ULTRASONIC TELEMTRY SYSTEM FOR THE ASSESSMENT OF LOCOMOTOR ACTIVITY IN FREE-RANGING RAINBOW TROUT, *SALMO GAIIRDNERI*, RICHARDSON. *J. Fish Biol.* 25(6):697-710. 1984. SFA 30(1)

[Warner-Lambert/Parke-Davis Res. Inst., Sheridan Park, Mississauga, ON L5K 1B4, Canada]

85-000412 Rooney, D. J. and P. R. Laming. EFFECTS OF OLFACTORY BULB ABLATION ON CARDIAC AND VENTILATORY AROUSAL RESPONSES AND THEIR HABITUATION IN THE GOLDFISH *CARASSIUS AURATUS*. *Behav. Neural Biol.* 4(2):120-126. 1984. SFA 30(1)

[Dep. Zool., Queen's Univ., Belfast, Northern Ireland]

85-000413 Sabat, A. REGULATION OF SOCIAL INTERACTIONS IN AN HERMAPHRODITIC CORAL-REEF FISH. *Am. Zool.* 24(3):52A. 1984. Abstract only. SFA 30(1)

[Univ. Puerto Rico, Mayaguez]

85-000414 Stang, D. L. and W. A. Hubert. SPATIAL SEPARATION OF FISHES CAPTURED IN PASSIVE GEAR IN A TURBID PRAIRIE LAKE. *Environ. Biol. Fishes* 11(4):309-314. 1984. SFA 30(1)

[Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011] Spatial separation of fishes in the littoral zone of a turbid prairie lake (Clear Lake, Iowa) was assessed with gill nets and fyke nets. Catch per unit of effort was used to determine differences among habitat types, sampling times within a 24 h period, and sampling months. Four of 10 species examined were significantly more numerous in one of the three habitats--nonvegetated, vegetated, or gravel-rock substrate. Black bullhead (*Ictalurus melas*) and bigmouth buffalo (*Ictiobus cyprinellus*) were most abundant in vegetated areas, yellow bass (*Morone mississippiensis*) in gravel-rock areas, and

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85-000414 CONTINUED channel catfish (*Ictalurus punctatus*) in both non-vegetated and gravel-rock areas. Temporal patterns in habitat use were indicated for these four species, as well as yellow perch (*Perca flavescens*), white bass (*Morone chrysops*), common carp (*Cyprinus carpio*), walleye (*Stizostedion vitreum vitreum*), black crappie (*Pomoxis nigromaculatus*), white sucker (*Catostomus commersoni*).

85-000415 Stark, A. L. ECOETHOLOGY OF THE BEAUGREGORY, *EUPOMACENTRUS LEUCOSTICTUS* MÜLLER & TROSCHEL (TELEOSTEI: POMACENTRIDAE), WITH AN EMPHASIS ON AGGRESSIVE BEHAVIOR AND ITS ENDOCRINE CONTROL. Ph.D. dissertation, Univ. South Fla. 1103p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(7):2070. 1985. SFA 30(1)

85-000416 Stauffer, J. R., Jr.; D. R. Lispi and C. H. Hocutt. THE PREFERRED TEMPERATURES OF THREE *SEMOTILUS* SPECIES. *Arch. Hydrobiol.* 101(4):595-600. 1984. SFA 30(1)

[Sch. For. Resour., Ferguson Bldg., Pa. State Univ., University Park 16802]
The final preferred temperatures of *Semotilus atromaculatus*, *Semotilus corporalis* and *Semotilus margarita* were 26.4, 22.3 and 16.0C, respectively. The preferred temperature/acclimation temperature response curves for each species were significantly different ($P \leq .05$) and coincided with thermal characteristics of their respective distributions.

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[Dep. Zool., Univ. Leicester, Leicester LE1 7RH, U.K.]

85-000418 Taborsky, M. BROODCARE HELPERS IN THE CICHLID FISH *LAMPROLOGUS BRICHARDI*: THEIR COSTS AND BENEFITS. *Anim. Behav.* 32(4):1236-1252. 1984. SFA 30(1)

[Zool. Inst., Univ. Wein, Dr. Karl-Lueger-Ring 1, A-1010 Vienna, Austria]

85-000419 Yano, K.; T. Ichihara; A. Nakamura and S. Tanaka. ESCAPE BEHAVIOR OF THE CHUM SALMON *ONCHORHYNCHUS KETA* UPON ENCOUNTERING DALL'S PORPOISE *PHOCOENOIDES DALLI*. *Bull. Jpn. Soc. Sci. Fish.* 50(8):1273-1277. 1984. SFA 30(1)

[Fac. Mar. Sci. Technol., Tokai Univ., Orido, Shinizu, Shizuoka 424, Japan]

LIFE HISTORY-GENERAL WORKS

85-000420 Agafonova, T. B. and P. A. Bukamin. DISTRIBUTION AND SOME BIOLOGICAL OBSERVATIONS OF *ARIOMMA BONDI* (ARIOMMIDAE) FROM THE CENTRAL-EASTERN ATLANTIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(2):96-100. 1984. SFA 30(1)

[VNIRO, Moscow, USSR]

85-000421 Baldwin, M. E. HABITAT USE, DISTRIBUTION, LIFE HISTORY, AND INTERSPECIFIC ASSOCIATIONS OF *NOTROPIS PHOTOGENIS* (SILVER SHINER: OSTEICHTHYES: CYPRINIDAE) IN CANADA, WITH COMPARISONS WITH *NOTROPIS*

SPORT FISHERY ABSTRACTS

LIFE HISTORY-GENERAL WORKS (CONTINUED)

85-000421 CONTINUED *RUBELLUS* (ROSYFACE SHINER). *M.S. thesis, Carleton Univ. (Canada)* 1983. From Masters. Abstr. 22(4):317. 1984. Abstract only. SFA 30(1)

85-000422 Beaumont, W. R. C. and R. H. K. Mann. THE AGE, GROWTH AND DIET OF A FRESHWATER POPULATION OF THE FLOUNDER, *PLATICHTHYS FLESUS* (L.), IN SOUTHERN ENGLAND. *J. Fish Biol.* 25(5):607-616. 1984. SFA 30(1)

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset BH20 6BB, England] Otoliths from 640 flounders from the River Frome, a chalk river in southern England, were used for age and growth studies together with length-frequency data. Mean lengths at ages I-V were 89, 151, 225, 304 and 323 mm respectively; these are higher than have been reported for marine populations. All flounders caught were immature and, on reaching the sea, both sexes probably became sexually mature a year older than did the marine populations. Flounder diets in freshwater comprised largely aquatic insects, Mollusca and Crustacea but there were differences between large and small fish; seasonal changes in diet largely reflected prey availability. It is suggested that competition for food and space in estuaries between 0 group flounders have given rise to the migration into fresh water.

85-000423 Cochnauer, T. G. ABUNDANCE, DISTRIBUTION, GROWTH AND MANAGEMENT OF WHITE STURGEON (*ACIPENSER TRANSMONTANUS*) IN THE MIDDLE SNAKE RIVER, IDAHO. *Ph.D. dissertation, Univ. Idaho* 60p. 1983. From Diss. Abstr. Int. B Sci. Eng. 45(5):1335. 1984. SFA 30(1)

A three year study (1979-81) was undertaken to gain additional life history information on white sturgeon (*Acipenser transmontanus*), determine distribution and relative abundance in the Snake River above Brownlee Reservoir, and determine whether present catch and release regulations could be relaxed to allow some harvest. A total of 924 sturgeon were captured, measured, tagged and released. These fish ranged in total length from 45.0 to 270.5 cm, and from .2 to 95.9 kg body weight. Sturgeon were most abundant between Bliss and C. J. Strike dams; based on mark and recapture techniques an estimated 2,191 (1,479-4,276 95% confidence interval) were in this reach. Populations characteristics were used in a simulation model to determine the effects of different harvest regimes for the section. A conservative estimate of allowable harvest that would maintain existing levels of spawners between Bliss and C. J. Strike dams is no more than a total of six sturgeon (between 125.0 and 183.0 cm) annually. In the river sections above Bliss Dam and below C. J. Strike Dam, 16 and 10 white sturgeon, respectively were found. The recommended management direction for these sections would be to continue catch and release fishing or initiate complete closure if illegal harvest and hooking mortality (due to catch and release) become a major source of mortality.

85-000424 Crowder, L. B. and H. L. Crawford. ECOLOGICAL SHIFTS IN RESOURCE USE BY BLOATERS IN LAKE MICHIGAN. *Trans. Am. Fish. Soc.* 113(6):694-700. 1984. SFA 30(1)

[Dep. Zool., N.C. State Univ., Box 7617, Raleigh 27695]

85-000425 Eyberg, I. THE BIOLOGY OF *PARABLENNIUS CORNUTUS* (L.) AND *SCARTELLA EMARGINATA* (GÜNTHER) (TELEOSTEI: BLENNIIDAE) ON A NATAL REEF. *S. Afr. Assoc. Mar. Biol. Res. Invest. Rep. No. 54*. 16p. 1984. Available from Oceangr. Res. Inst., P.O. Box 10712, Marine Parade, Durban, 4056, South Africa.

SPORT FISHERY ABSTRACTS

LIFE HISTORY-GENERAL WORKS (CONTINUED)

- 85-000426 Gibson, R. J. BROWN TROUT IN ST. JOHN'S. *Osprey* 13(3):72-76. 1982. SFA 30(1)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]
- 85-000427 Gilbert, P. W. BIOLOGY AND BEHAVIOUR OF SHARKS. *Endeavour* 8(4):179-187. 1984. SFA 30(1)
- 85-000428 Goto, A. COMPARATIVE ECOLOGY OF YOUNG-OF-THE-YEAR BETWEEN TWO AMPHIDROMOUS SPECIES OF *COTTUS* IN HOKKAIDO 1. UPSTREAM MIGRATION AND GROWTH. *Bull. Fac. Fish. Hokkaido Univ.* 35(3):133-143. 1984. SFA 30(1)
[Lab. Embryol. Genet., Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]
- 85-000429 James, P. W. THE LIFE HISTORY OF THE YOKE DARTER. *Trans. Mo. Acad. Sci.* 17:196. 1983. Abstract only. SFA 30(1)
[Biol. Dep., Southwest Mo. State Univ., Springfield 65804] Aspects of the life history of the yoke darter (*Etheostoma juliae*) were studied in the James River, Mo. *E. juliae* attained a maximum standard length of about 71 mm with a maximum longevity of three years. Spawning began in mid-May and continued through mid-July. Females contained clutches of 70-80 maturing ova with fully mature eggs 1.3-1.5 mm in diameter. Males and females spawned in their first year of life provided they had attained sizes of 30 mm and 32 mm respectively. *E. juliae* of all sizes fed on larvae and nymphs of aquatic insects. The success of this species can probably be attributed to its ability to inhabit the swiftest part of a riffle where competition with other darters is reduced.
- 85-000430 Kalinina, E. M. and N. F. Shevchenko. BIOLOGY OF *VINCIGUERRIA NIMBARIA* IN THE EQUATORIAL WATERS OF THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtirol.)* 24(2):60-65. 1984. SFA 30(1)
[Inst. Biol. South. Seas, Acad. Sci. SSR, Sevastopol, USSR]
- 85-000431 Lalancette, L. CROISSANCE, REPRODUCTION ET RÉGIME ALIMENTAIRE DE LA MORUE, *GADUS MORHUA*, VIVANT DANS LE FJORD DU SAGUENAY, AU QUÉBEC. [GROWTH, REPRODUCTION AND FOOD OF COD, *GADUS MORHUA*, FROM THE SAGUENAY FJORD, QUEBEC.] *Can. Field-Nat.* 98(3):305-314. 1984. SFA 30(1)
[Dep. Sci. Fond., Univ. Quebec, Chicoutimi, PQ G7H 2B1, Canada]
- 85-000432 Leak, J. C. GROWTH AND SURVIVAL OF BAY ANCHOVY (*ANCHOA MITCHILLI*) LARVAE IN NORTH BISCAYNE BAY, FLORIDA. *Ph.D. dissertation, Univ. Miami* 128p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(6):1699. 1984. SFA 30(1)
- 85-000433 Lindholm, R. OBSERVATIONS ON THE CHINAMAN LEATHERJACKET *NELUSETTA AYRAUDI* (QUOY & GAIMARD) IN THE GREAT AUSTRALIAN BIGHT. *Aust. J. Mar. Freshwater Res.* 35(5):597-599. 1984. SFA 30(1)
[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, N.S.W. 2230, Australia]
- 85-000434 Magnan, P. and G. J. FitzGerald. ONTOGENETIC CHANGES IN DIET ACTIVITY, FOOD HABITS AND SPATIAL DISTRIBUTION OF JUVENILE AND ADULT CREEK CHUB, *SEMOTILUS ATROMACULATUS*. *Environ. Biol. Fishes* 11(4):301-307. 1984.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

85-000434 CONTINUED SFA 30(1)

[Dep. Biol., Univ. Laval, PQ G1K 7P4, Canada]

85-000435 Marcus, M. D.; W. A. Hubert and S. H. Anderson. HABITAT SUITABILITY INDEX MODELS: LAKE TROUT (EXCLUSIVE OF THE GREAT LAKES). *U.S. Fish Wildl. Serv. FWS/OBS-82/10.84*. vi + 12p. 1984. SFA 30(1)

[Western Aquatics, Inc., P.O. Box 546, Laramie, WY 82070]

85-000436 Mayden, R. L. and S. J. Walsh. LIFE HISTORY OF THE LEAST MATDOME *NOTURUS HILDEBRANDI* (SILURIFORMES: ICTALURIDAE) WITH COMPARISONS TO RELATED SPECIES. *Am. Midl. Nat.* 112(2):349-368. 1984. SFA 30(1)

[Mus. Nat. Hist., Univ. Kans., Lawrence 66045] Aspects of reproduction, age, growth, development and food habits of 403 specimens of *Noturus hildebrandi* were studied from collections made in the North Fork Obion River, Tennessee. The least matdome lived a maximum of 18 months and reached a maximum SL of 52 mm; 12-month-old individuals averaged 39 mm. Individuals grew at a decreasing rate in SL and at a constant rate in body weight. Growth rates were highest from hatching to the 1st month and decreased steadily to only 1% during the reproductive season. Both sexes matured at ca. 35 mm SL and spawned in June and July of their second summer. Females produced 17-38 (mean = 29.9) mature oocytes (2.3 mm diam) and had a mean relative fecundity (30.0 oocytes/g adjusted body weight) higher than most other ictalurids. Large females spawned earlier than smaller females and produced more oocytes. Six clutches of captive-spawned embryos averaged 19.2; chorionic diam ranged from 3.1-3.8 mm (mean = 3.4) and yolk diam ranged from 2.6-3.2 mm (mean = 2.9). Mesolarvae hatched in 193-209 hr at 25 C and averaged 6.3 mm TL (range 5.6-6.6 mm). Principal food items were larvae of midges, caddisflies, stoneflies and mayflies. Least matdomes were parasitized by nematodes and flukes.

85-000437 Natanson, L. J.; G. M. Cailliet and B. A. Welden. AGE, GROWTH AND REPRODUCTION OF THE PACIFIC ANGEL SHARK (*SQUATINA CALIFORNICA*) FROM SANTA BARBARA, CALIFORNIA. *Am. Zool.* 24(3):27A. 1984. Abstract only. SFA 30(1)

[Moss Landing Mar. Lab., Moss Landing, CA] Vertebrae, body size measurements, and data on reproductive maturity were taken from 334 angel sharks collected from commercial gill netters from September 1979 to November 1983. Radiographs of centra from 247 of these delineated calcified bands for age determination. Our smallest newborn sharks (260 mm TL) had 6 or 7 bands while the largest (1140 mm TL) had 42. We hypothesize that band deposition rate is more closely related to somatic growth than to monthly or yearly time periods. This hypothesis is supported by the number of bands in embryos and newborn angel sharks, allometric growth patterns of girth measurements and vertebral centrum dimensions, laboratory grow-out studies including 2 angel sharks which deposited bands subsequent to tetracycline injection, and radiometric age estimates using Lead-210 decay rates in centra of 2 adult angel sharks. Angel sharks of both sexes mature at 900-1000 mm TL. Monthly gonad samples from pregnant females indicate a 10 month gestation period. Pupping occurs between March and June.

85-000438 Sandheinrich, M. B. and W. A. Hubert. INTRASPECIFIC RESOURCE PARTITIONING BY YELLOW PERCH (*PERCA FLAVESCENS*) IN A STRATIFIED LAKE. *Can. J. Fish. Aquatic Sci.* 41(12):1745-1752. 1984. In English with French summ. SFA 30(1)

[Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

85-000439 Shepard, T. E. and B. M. Burr. SYSTEMATICS, STATUS, AND LIFE HISTORY ASPECTS OF THE ASHY DARTER, *ETHEOSTOMA CINEREUM* (PISCES: PERCIDAE). *Proc. Biol. Soc. Wash.* 97(4):693-715. 1984. SFA 30(1)

[Apt. 132, Cañas, Guanacaste, Costa Rica] *Etheostoma cinereum*, an endemic of the Cumberland and Tennessee River drainages, is redescribed and diagnosed. Although the species has historically been collected in 15 tributary systems, it has been taken from only 7 in the past 20 years. Sexual dimorphism exists in breeding coloration, size and shape of the genital papilla, tuberculation, and several body proportions. Geographic trends in meristic and morphometric characters indicate that somewhat distinct populations exist in the Cumberland, Duck, and upper Tennessee drainages; no subspecies are recognized. *Etheostoma cinereum* is a pool-inhabiting species often associated with cover in the form of boulders, snags, and stands of *Justicia*. The maximum life-span is 52 months, maximum size is 100 mm SL. A sex ratio of 1.5 females to 1 male was found. Spawning apparently occurs from late January to mid-April. Females at the peak of the spawning season contain an average of 53 mature ova per gram adjusted body weight. The diet consists primarily of chironomids, *Ephemera* larvae, and oligochaetes. Individuals are parasitized by fluke metacercariae, encysted nematodes, and acanthocephalan worms.

85-000440 Stevens, J. D. BIOLOGICAL OBSERVATIONS ON SHARKS CAUGHT BY SPORT FISHERMEN OFF NEW SOUTH WALES. *Aust. J. Mar. Freshwater Res.* 35(5):573-590. 1984. SFA 30(1)

[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, N.S.W. 2230, Australia] Between 1979 and 1982, 523 sharks representing four families and 13 species were examined from sport fishing catches off New South Wales. Additional catch data were available from records of the Sydney Game Fishing Club extending from 1953 to 1979. The species composition of sharks caught changes through the year, probably as a result of seasonal variations in water temperature. *Prionace glauca* and *Isurus oxyrinchus* are most abundant in the catches during the cooler months from May to November. *Galeocerdo cuvieri*, *Carcharhinus brevipinna*, *C. longimanus*, *C. falciformis*, *C. limbatus* and *Sphyrna lewini* are taken principally during the warmer months from December to April. The sex ratio of *P. glauca* and *Sphyrna zygaena* changes through the year due to a seasonal influx of gravid females. At least six of the species examined give birth off New South Wales and, apart from *C. falciformis*, all of these appear to have restricted breeding seasons. *P. glauca* and *S. zygaena* feed mainly on cephalopods and to a lesser extent on fish, *I. oxyrinchus* principally on fish, and *G. cuvieri* mostly on fish, birds, unidentified mammals and cephalopods.

85-000441 Takahashi, S. and T. Hidaka. THE OFFSHORE LIFE OF ISAZA LARVAE *CHAENOGOBIUS ISAZA* IN LAKE BIWA. *Bull. Jpn. Soc. Sci. Fish.* 50(11):1803-1809. 1984. SFA 30(1)

[Inst. Paleolimnol. Paleoenviron. Lake Biwa, Kyoto Univ., Takashima, Shigaken 520-11, Japan]

85-000442 Thorson, T. B. OBSERVATIONS ON THE MORPHOLOGY, ECOLOGY AND LIFE HISTORY OF THE EURYHALINE STINGRAY, *DASYATIS GUTTATA* (BLOCH AND SCHNEIDER) 1801. *Acta Biol. Venez.* 11(4):95-125. 1983. In English with Spanish summ. SFA 30(1)

[Sch. Life Sci., Univ. Nebr., Lincoln 68588]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

85-000443 Tito Rodriguez P., W. ESTUDIO PRELIMINAR PARA EVALUAR LAS CARACTERISTICAS BIOLOGICAS PESQUERAS DE *MYCTROPERCA OLFA* EN LAS ISLAS GALAPAGOS (ECUADOR). [PRELIMINARY STUDIES TO EVALUATE THE BIOLOGICAL CHARACTERISTICS OF *MYCTROPERCA OLFA* IN THE GALAPAGOS ISLANDS (ECUADOR).] *Inst. Nac. Pesca Bol. Sci. Tec. (Guayaquil)* 6(3):1-48. 1984. SFA 30(1)
[Inst. Nac. Pesca, Casilla 5918, Guayaquil, Ecuador]

85-000444 Twomey, K. A.; K. L. Williamson and P. C. Nelson. HABITAT SUITABILITY INDEX MODELS AND INSTREAM FLOW SUITABILITY CURVES: WHITE SUCKER. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.64*. viii+56p. 1984. SFA 30(1)
[Wyo. Coop. Fish. Res. Unit, Univ. Wyo., Laramie 82071]

85-000445 Wiborg, K. F.; J. Gjøsæter and I. M. Beck. *GONATUS FABRICII* (LICHTENSTEIN). UNDERSØKELSER I NORSKEHAVET OG DET VESTLIGE BARENTSHAVET I JUNI-SEPTEMBER 1982 OG 1983. [*GONATUS FABRICII* (LICHTENSTEIN). INVESTIGATIONS IN THE NORWEGIAN AND WESTERN BARENTS SEAS, JUNE-SEPTEMBER 1982 AND 1983.] *Fisken Havet* 1984 (2):1-11. 1984. In Norwegian with English summ. SFA 30(1)
[Fisheridir. Havforskningsinst., Bergen, Norway]

85-000446 Wick, E. J.; D. L. Stoneburner and J. A. Hawkins. OBSERVATIONS ON THE ECOLOGY OF COLORADO SQUAWFISH (*PTYCHOCEILUS LUCIUS*) IN THE YAMPA RIVER, COLORADO, 1982. *Natl. Park Serv. Water Resour. Field Support Lab. Rep. No. 83-7*. vi+55p. 1983. SFA 30(1)
[Water Resour. Field Support Lab., Natl. Park Serv., Colo. State Univ., Fort Collins 80523]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

85-000447 Aguayo H., M. and H. Robotham V. DINÁMICA POBLACIONAL DE MERLUZA COMÚN (*MERLUCCIIUS GAYI GAYI*) (GADIFORMES-MERLUCCIIDAE). [POPULATION DYNAMICS OF HAKE (*MERLUCCIIUS GAYI GAYI*) (GADIFORMES MELUCCIIDAE).] *Inst. Fom. Pesq. Invest. Pesq.* 31:17-45. 1984. In Spanish with English summ. SFA 30(1)
[Inst. Fom. Pesq., Casilla 1287, Santiago, Chile]

85-000448 Claridge, P. N. and I. C. Potter. ABUNDANCE, MOVEMENTS AND SIZE OF GADOIDS (TELEOSTEI) IN THE SEVERN ESTUARY. *J. Mar. Biol. Assoc. U.K.* 64(4):771-790. 1984. SFA 30(1)
[N.E.R.C. Inst. Mar. Environ. Res., Prospect Place, The Hoe, Plymouth, PL1 3DH, England]

85-000449 Covington, W. G.; R. E. Marteney and C. F. Rabeni. POPULATION CHARACTERISTICS OF SYMPATRIC SMALLMOUTH BASS AND ROCK BASS IN THE JACKS FORK AND CURRENT RIVERS, MISSOURI. *Trans. Mo. Acad. Sci.* 17:27-35. 1983. SFA 30(1)
[Mo. Dep. Conserv., Fish. Res. Sect., Columbia 65201] Population characteristics of smallmouth bass (*Micropterus dolomieu*) and rock bass (*Ambloplites rupestris*) were examined at sites of varying relative densities and habitat conditions in the Jacks Fork and Current rivers. Growth of each species was somewhat slower than in other Ozark headwater streams.

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POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

85-000449 CONTINUED Differences in production were related to densities of rock bass and longevity of smallmouth bass. The growth, density, biomass, and condition of neither species seemed to be affected by the density and biomass of the other. Population characteristics appeared to be more closely related to habitat characteristics--especially water depth, the availability of cover, and mean current velocity.

85-000450 Crawford, R. W. ECOLOGICAL RELATIONSHIPS AND DIVERSITY OF FISHES IN A SMALL, NATURAL OXBOW. *M.A. thesis, Northeast Mo. State Univ.* 115p. 1976. From Masters Abstr. 22(4):329. 1984. Abstract only. SFA 30(1)

85-000451 Gabelhouse, D. W., Jr. AN ASSESSMENT OF CRAPPIE STOCKS IN SMALL MIDWESTERN PRIVATE IMPOUNDMENTS. *N. Am. J. Fish. Manage.* 4(4A):371-384. 1984. SFA 30(1)

[Kans. Fish Game Comm., 832 East 6th Ave., Emporia, KS 66801]

85-000452 Hashimoto, H. POPULATION STRUCTURE OF THE SANDEEL AROUND JAPAN. *Bull Jpn. Soc. Sci. Fish.* 50(8):1357-1365. 1984. SFA 30(1)

[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan]

85-000453 Huh, S. H. SEASONAL VARIATIONS AND TROPHIC RELATIONSHIPS AMONG CONCENTRATED POPULATIONS OF SMALL FISHES IN SEAGRASS MEADOWS. *Ph.D. dissertation, Univ. Tex. (Austin)* 116p. 1983. From Diss. Abstr. Int. B Sci. Eng. 45(5):1368. 1984. SFA 30(1)

85-000454 Kachina, T. F. and N. P. Sergeyeva. NATURAL MORTALITY IN WALLEYE POLLOCK, *THELAGRA CHALCOGRAMMA* (GADIDAE), IN THE EASTERN PART OF THE OKHOTSK SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtirol.)* 24(2):159-163. 1984. SFA 30(1)

85-000455 Krykhtin, M. L. COMPARATIVE ASSESSMENT OF REPRODUCTION, MORTALITY AND ABUNDANCE OF SOME FRESHWATER FISHES OF THE AMUR RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtirol.)* 24(2):26-33. 1984. SFA 30(1)

[AotINRO, Khabarovsk, USSR]

85-000456 Lambert, T. C. LARVAL COHORT SUCCESSION IN HERRING (*CLUPEA HARENGUS*) AND CAPELIN (*MALLOTUS VILLOSUS*). *Can. J. Fish. Aquatic Sci.* 41(11):1552-1564. 1984. In English with French summ. SFA 30(1)

[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth NS B2Y 4A2, Canada]

85-000457 Lambert, T. C. and D. M. Ware. REPRODUCTIVE STRATEGIES OF DEMERSAL AND PELAGIC SPAWNING FISH. *Can. J. Fish. Aquatic Sci.* 41(11):1565-1569. 1984. In English with French summ. SFA 30(1)

[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

85-000458 Luey, J. E. and I. R. Adelman. STOCK STRUCTURE OF RAINBOW SMELT IN WESTERN LAKE SUPERIOR: POPULATION CHARACTERISTICS. *Trans. Am. Fish. Soc.* 113(6):709-715. 1984. SFA 30(1)

[Div. Water Qual. Monit. Assess., Ohio Environ. Prot. Agency, P.O. Box 1049, Columbus 43216]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

85-000459 Luts, G. I.; S. F. Rogov; Y. V. Pryakhin and I. M. Nikul'shin. POPULATION DYNAMICS OF TYULKA, *CLUPEONELLA DELICATULA DELICATULA*, SHAD, *ALOSA PONTICA PONTICA* (CLUPEIDAE), AND ANCHOVEY, *ENGRAULIS ENCRASICHOLUS MAEOTICUS* (ENGRAULIDAE), OF THE SEA OF AZOV. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(1):1-9. 1984. SFA 30(1)
[AzNIIRKh, Rostov-on-Don, USSR]

85-000460 Orth, D. J. and O. E. Maughan. COMMUNITY STRUCTURE AND SEASONAL CHANGES IN STANDING STOCKS OF FISH IN A WARM-WATER STREAM. *Am. Midl. Nat.* 112(2):369-378. 1984. SFA 30(1)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061]

85-000461 Penczak, T. and M. Molinski. FISH PRODUCTION IN OUED SEBAOU, A SEASONAL RIVER IN NORTH ALGERIA. *J. Fish Biol.* 25(6):723-732. 1984. SFA 30(1)
[Inst. Environ. Biol., Univ. Łódź, 90-237 Łódź, Banacha 12/16, Poland]

85-000462 Peterman, R. M. and F. Y. C. Wong. CROSS CORRELATIONS BETWEEN RECONSTRUCTED OCEAN ABUNDANCES OF BRISTOL BAY AND BRITISH COLUMBIA SOCKEYE SALMON (*ONCORHYNCHUS NERKA*). *Can. J. Fish. Aquatic Sci.* 41(12):1814-1824. 1984. In English with French summ. SFA 30(1)
[Nat. Resour. Manage. Proj., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

85-000463 Prouzet, P. CARACTÉRISTIQUES DU STOCK DE SAUMON ATLANTIQUE (*SALMO SALAR* L.) CAPTURÉ À LA LIGNE SUR L'AULNE (RIVIÈRE DE BRETAGNE-NORD) DURANT LA PÉRIODE 1973-1981. [CHARACTERISTICS OF THE ATLANTIC SALMON (*SALMO SALAR* L.) CAUGHT BY ANGLING IN THE AULNE RIVER (NORTH BRITTANY) FROM 1973 TO 1981.] *Rev. Trav. Inst. Pêches Marit.* 46(4):285-298. 1982 (1984). In French with English summ. SFA 30(1)
[IFREMER, Cent. Brest, B.P. 337, 29273 Brest Cedex, France]

85-000464 Quinn, N. J. DYNAMICS AND EXPLOITATION OF FISH RESOURCES NEAR THE MOUTH OF THE MARKHAM RIVER, PAPUA NEW GUINEA. *Ph.D. dissertation, Univ. Queensland (Australia)* 238p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(6):1699. 1984. SFA 30(1)

85-000465 Riley, S. C.; A. T. Bielak and G. Power. THE ATLANTIC SALMON STOCK OF THE GRAND WATSHISHOU RIVER (QUÉBEC). A HISTORICAL PERSPECTIVE. *Nat. Can. (Que.)* 111(3):219-228. 1984. In English with French summ. SFA 30(1)
[Biol. Dep., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada] Investigations carried out during the summers of 1981-1983 reveal that the Grand Watshishou River (Québec) presently supports a plentiful Atlantic salmon stock. The historical range of this species in the Watshishou extended at least 93 km from the mouth of the river. Growth rates and abundance of salmon parr appear to be high, indicating that the Watshishou is relatively productive. The adult spawning population of the Watshishou is composed of grilse (one sea-winter salmon) and two sea-winter salmon, as well as a small proportion of previous spawners. No three sea-year virgin fish were found. The proportion of female grilse in the Watshishou appears to be higher than would be expected based on data from other rivers on the north shore of the Gulf

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

85-000465 CONTINUED of St. Lawrence. Mean smolt age (3.5-3.7 years) is also slightly high. There is no consistent trend in the total angling catch of the Great Watchichou Club. Regression analyses do not indicate any significant trends in the proportions of grilse or two sea-winter salmon in the run over the past 25 years (1959-1983). Neither do there appear to be any significant trends in the total and age-specific mean weights during the same period. Graphical representation of these data, however, suggests that changes similar to those that have occurred elsewhere in Canada (i.e. increasing proportions of grilse, decreasing proportions of two sea-winter salmon, and decreasing total mean weight) may be starting to occur.

85-000466 Ryland, J. S. and T. O. Ajayi. GROWTH AND POPULATION DYNAMICS OF THREE RAJA SPECIES (BATOIDEI) IN CARMARTHEN BAY, BRITISH ISLES. *J. Cons. Cons. Int. Explor. Mer* 41(2):111-120. 1984. SFA 30(1)

[Dep. Zool., Univ. Coll. Swansea, Swansea SA2 8PP, Wales] Growth and population dynamics have been studied in a mixed population of *Raja clavata*, *R. microcellata*, and *R. montagui* in Carmarthen Bay, South Wales, from 1974 to 1976. All, but especially the first two species, are fished commercially. An improved method for displaying the annuli in vertebrae is described, and all the data obtained are based on fish of established age. The maturation stages of the ovary and a previously unreported seasonal cycle of development and regression of mixopterygia (claspers) are described. For *R. clavata*, *R. microcellata*, and *R. montagui* respectively the maximum age and mean length at that age of trawled fish was 12 years and 1047 mm, 9 years and 875 mm, and 7 years and 710 mm, but older, larger fish were caught by anglers. The values of the von Bertalanffy parameters L_{∞} and K were 1392 mm and 0.090, 1370 mm and 0.086, and 978 mm and 0.152 respectively. Females grew larger than males. First spawning in all three species occurs mainly in the fifth year. Total mortality based on research vessel catches for the three species was estimated as $Z=0.45$, 0.54, and 0.46 respectively, but differences were found between the sexes, Z always being higher in males. For females and males respectively, estimates were $Z=0.27$ and 0.56, 0.38 and 0.56, and 0.48 and 0.72. Using the multiple regression devised by Pauly (1980), natural mortality was estimated as $M=0.16$ in *R. clavata* and $M=0.14$ in *R. microcellata*, hence $F=0.29$ and 0.40 respectively. For the smaller and less exploited *R. montagui*, $M=0.25$ and $F=0.21$. Fecundity in *R. clavata* and *R. microcellata* is probably less than 100 eggs annually, the counts indicating minima of 62 to 74 and 54 to 61 eggs respectively. Most of the rays in Carmarthen Bay are young, with fish of age groups 0 to 2 comprising 87%, 71%, and 92% of the analysed catch of *R. clavata*, *R. microcellata*, and *R. montagui* respectively. Rays in the oldest age group of the three species represented by other than an occasional fish had mean measurements of 68%, 64%, and 73% of their L_{∞} and estimated ages corresponding to 0.7 L_{∞} are 16.0, 17.0, and 9.6 years respectively. The findings are discussed and it is concluded that, while the stock is probably depleted, growth being insufficient to support the present level of exploitation, there should be no danger of recruitment failure so long as Z remains less than about 0.7.

85-000467 Schill, D. J. and J. S. Griffith. USE OF UNDERWATER OBSERVATIONS TO ESTIMATE CUTHROAT TROUT ABUNDANCE IN THE YELLOWSTONE RIVER. *N. Am. J. Fish. Manage.* 4(4B):479-487. 1984. SFA 30(1)

[Dep. Biol., Idaho State Univ., Pocatello 83209]

85-000468 Shul'man, G. E. and S. Y. Urdenko. RELATIONSHIPS BETWEEN GENERATIVE AND SOMATIC PRODUCTION IN BLACK SEA FISH. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR)* 275(1-6):221-223. 1984. SFA 30(1)

[Inst. Biol. South. Seas, Acad. Sci. Ukrainian SSR, Sevastopol, USSR]

SPORT FISHERY ABSTRACTS

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

85-000469 Solazzi, M. F. RELATIONSHIPS BETWEEN VISUAL COUNTS OF COHO, CHINOOK AND CHUM SALMON FROM SPAWNING FISH SURVEYS AND THE ACTUAL NUMBER OF FISH PRESENT. *Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep. No. 84-7*. 22p. 1984. SFA 30(1)

[Oreg. Dep. Fish Wildl., Res. Dev. Sect., Corvallis]

85-000470 Tikhonov, V. I. YEAR-CLASS STRENGTH OF YELLOWFIN SOLE, *LIMANDA ASPERA* (PLEURONECTIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(2):20-25. 1984. SFA 30(1)

[KotINRO, Petropavlovsk-Kamchatskiy, USSR]

85-000471 Ursin, E. THE TROPICAL, THE TEMPERATE AND THE ARCTIC SEAS AS MEDIA FOR FISH PRODUCTION. *Dana* 3:43-60. 1984. SFA 30(1)

[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark]

85-000472 Warner, R. R. POPULATION DENSITY, MATING TERRITORIALITY, AND SEX CHANGE IN CORAL REEF FISHES. *Natl. Geogr. Soc. Res. Rep.* 17:909-912. 1984. SFA 30(1)

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

85-000473 Alheit, J.; V. H. Alarcon and B. J. Macewicz. SPAWNING FREQUENCY AND SEX RATIO IN THE PERUVIAN ANCHOVY, *ENGRAULIS RINGENS*. *Calif. Coop. Oceanic Fish. Invest. Rep.* 25:43-52. 1984. In English with Spanish summ. SFA 30(1)

[PROCOPA, Inst. de Mar de Perú, Apt. 22, Calao, Perú] Spawning frequency was determined for the first time for the Peruvian anchovy, *Engraulis ringens*, using the incidence of postovulatory follicles. The agreement between two independent frequency estimates, one for females taken one day after spawning and another for females taken two days after spawning, demonstrated the reliability of this method. In August-September, the main period of annual spawning, 16.04% of the female population of the central and northern anchovy stock off Peru spawned per day: i.e., every 6.23 days the average female spawned a new batch of eggs. Hydration of ovaries began as early as 0700 hours in the morning. Spawning occurred at night between 1800 and 0200 hours, reaching a maximum at about 2200 hours. Sex ratio was 57.9% females by weight. The vulnerability of females to the purse seine changed with their reproductive state. Females with hydrated ovaries who were ready to spawn seemed to attract males and to form male-dominated "spawning schools" by segregating from "normal" schools at night.

85-000474 Burr, B. M. and R. L. Mayden. REPRODUCTIVE BIOLOGY OF THE CHECKERED MADTOM (*NOTURUS FLAVATER*) WITH OBSERVATIONS ON NESTING IN THE OZARK (*N. ALBATER*) AND SLENDER (*N. EXILIS*) MADTOMS (SILURIFORMES: ICTALURIDAE). *Am. Midl. Nat.* 112(2):408-414. 1984. SFA 30(1)

[Dep. Zool., South. Ill. Univ., Carbondale 62901] The nesting biology of *Noturus flavater* was investigated in the North Fork White River, Missouri; other aspects of reproduction were analyzed from preserved specimens. *Noturus flavater* is the second largest species of *Noturus*, reaching at least 142 mm SL. Some females mature at 1 year and 57 mm SL; most are 2-3 years old and over 70 mm SL when mature. The number of mature ova per female ranged from 93-340, mean = 240 (N=7), and ova were 1.3-3.2 mm in diam. Nests were found on 11 July under large flat rocks in pools or raceways at 27

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

85-000474 CONTINUED C. Nest-guarding males were 3-5 years old and ranged in SL from 115-142 mm. One nest containing embryos and three containing meso- or metalarvae were found. The clutch of embryos numbered 304, yolk diam measured 3.4-3.7, mean = 3.6 mm. Mesolarvae averaged 9.7 mm TL, metalarvae 13.3 mm TL. The nesting biology of syntopic *N. albat* and *N. exilis* is briefly summarized.

85-000475 Cambray, J. A. and M. N. Bruton. THE REPRODUCTIVE STRATEGY OF A BARB, *BARBUS ANOPLUS* (PISCES: CYPRINIDAE), COLONIZING A MAN-MADE LAKE IN SOUTH AFRICA. *J. Zool. (Lond.)* 204(2):143-168. 1984. SFA 30(1)
[Albany Mus., Somerset St., Grahamstown 6140, South Africa]

85-000476 Chubb, C. F. and I. C. Potter. THE REPRODUCTIVE BIOLOGY AND ESTUARINE MOVEMENTS OF THE GIZZARD SHAD, *NEMATALOSA VLAMINGHI* (MUNRO). *J. Fish Biol.* 25(5):527-543. 1984. SFA 30(1)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, W.A. 6150, Australia]

85-000477 Conover, D. O. and B. E. Kynard. FIELD AND LABORATORY OBSERVATIONS OF SPAWNING PERIODICITY AND BEHAVIOR OF A NORTHERN POPULATION OF THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA* (PISCES: ATHERINIDAE). *Environ. Biol. Fishes* 11(3):161-171. 1984. SFA 30(1)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stony Brook 11794] The spawning periodicity and mating behavior of a northern population of the Atlantic silverside, *Menidia menidia*, was studied both in the field (Salem Harbor, Massachusetts) and in laboratory experiments. Spawning in the field coincided with new and full moons. Under conditions of unlimited food availability in artificial outdoor pools that received natural celestial illumination or in indoor aquaria receiving no evening illumination, spawning occurred every 1-3 days rather than fortnightly. These results suggest that tidal influences are a primary factor that synchronizes spawning in *M. menidia*. Published reports of diel time of spawning in both marine and freshwater species of *Menidia* indicate a generic tendency to spawn during mid-morning. This pattern coupled with high tides that cover suitable spawning substrates during mid-morning only at fortnightly intervals could account for the semilunar spawning cycle in marine populations of *Menidia*. Although general characteristics of the reproductive ecology of *M. menidia* in Massachusetts were similar to a thoroughly studied population in South Carolina, several differences were evident. The breeding season was shorter in Massachusetts (late April-June), and occurred over a much lower range of temperatures (9-21°C). Intensity and frequency of spawning was correlated with the height of high tide. Eggs were deposited only on mats of intertidal, filamentous algae rather than on roots or stems of *Spartina alterniflora* or other intertidal vegetation. Promiscuous spawning occurred in small, highly male-dominated groups of fish, primarily after the tide had begun to recede, and often at the water's edge. No predation on spawning adults was observed but the mummichog, *Fundulus heteroclitus*, fed daily on developing embryos during high tide.

85-000478 Dawes, J. A. SPAWNING SUCCESS BETWEEN AN EYELESS DWARF GOURAMI, *COLISA LALIA* FEMALE (HAMILTON-BUCHANAN), AND A SIGHTED MALE. *J. Aquaricult. Aquatic Sci.* 4(1-2):33-38. 1984. SFA 30(1)
[28 Kidston Way, Rudloe Park, Corsham, Wiltshire, SN13 0JZ, England]

85-000479 Dombeck, M. P. ECOLOGICAL FACTORS AFFECTING MUSKELLUNGE (*ESOX MASQUINONGY*) REPRODUCTION IN MIDWESTERN LAKES. *Ph.D. dissertation, Iowa State Univ.* 127p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(7):2025.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

85-000479 CONTINUED 1985. SFA 30(1)

Natural reproduction of muskellunge *Esox masquinongy* has failed in many waters that formerly supported self-sustaining populations. Laboratory studies showed high muskellunge egg mortality associated with high biological oxygen demand (BOD) substrates where hypoxic conditions developed at the substrate-water interface. Measured dissolved oxygen concentration (DO) at the substrate-water interface in muskellunge spawning sites in eight midwestern lakes showed that four lakes had high DO (mean, 6.0-8.4 mg/liter) and little microstratification, and support self-sustaining muskellunge populations. The remaining four lakes showed extreme DO microstratification and hypoxia (mean, 0.4-2.4 mg/liter) at the substrate-water interface. Populations of the latter are almost solely supported by stocking. Qualitative and quantitative observations of spawning areas in the eight lakes showed that suitable spawning area characteristics include low BOD substrates, dense stonewort *Chara* sp. beds, or reservoirs where water level is lowered annually, resulting in substrate aeration. Reproduction failure is associated with spawning areas characterized by deep organic matter accumulations and dense macrophyte growth. Improvements of spawning habitat to prevent or alleviate DO depletion are among the options available to manage this species. A method to obtain DO measures within 8 mm of the bottom was developed using oxygen-permeable dialysis tubing to obtain a sample, followed by a modification of the micro-Winkler technique. In controlled experiments, results showed that DO within dialysis tubing reach 99% equilibrium (via diffusion) with environmental DO within 3 hours in flowing water and 5 hours in stagnant water. Statistical analysis of ecological information on 117 selected lakes showed that nine variables accounted for 57% of the variability in natural muskellunge reproduction. Conditions identified as most strongly promoting reproduction were limited northern pike abundance, rising springtime water level, high alkalinity, and high shoreline development factor in drainage lake systems. When organized by discriminant function analysis, 58% of the lakes were classified identically to manager-estimated reproductive level, and 91% were classified within ± 1 reproductive level.

85-000480 Gustaveson, A. W.; T. D. Pettengill; J. E. Johnson and J. R. Wahl. EVIDENCE OF IN-RESERVOIR SPAWNING OF STRIPED BASS IN LAKE POWELL, UTAH-ARIZONA. *N. Am. J. Fish. Manage.* 4(4B):540-546. 1984. SFA 30(1)
[Utah Div. Wildl. Resour., Page, AZ 86040]

85-000481 Hampton, R. E. A POSSIBLE ROLE OF HABITUATION IN THE SEXUAL BEHAVIOUR OF MALE MOSQUITOFISH (*GAMBUSIA AFFINIS* BAIRD & GIRARD). *Anim. Behav.* 32(4):1262-1263. 1984. SFA 30(1)
[Dep. Biol., Lab. Anim. Behav. Behav. Ecol., Cent. Mich. Univ., Mt. Pleasant 48859]

85-000482 Haymes, G. T. and D. P. Kolenosky. DISTRIBUTION AND CHARACTERISTICS OF SPAWNING ROUND WHITEFISH IN LAKE ONTARIO, 1976-1981. *Ontario Fish. Tech. Rep. Ser.* No. 14. ii+9p. 1984. SFA 30(1)
[Ontario Hydro Res. Div., KD 118, 800 Kipling Ave., Toronto, ON M8Z 5S4, Canada]

85-000483 Hein, S. and J. Shepard. SPAWNING PEAK OF RED DRUM (*SCIAENOPS OCELLATA*) IN SOUTHEAST LOUISIANA. *La. Dep. Fish. Mar. Res. Lab. Tech. Bull.* No. 38. 9-11. 1984. SFA 30(1)

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

85-000483 CONTINUED

[La. Mar. Res. Lab., Grand Isle, LA] The spawning season for red drum (*Sciaenops ocellata*) in Southeast Louisiana, as determined by gonadosomatic indices (GSI), was determined to be in mid-September. Further proof of the spawn was substantiated by the capture of juvenile red drum in October. The spawning period during the annual cycle was relatively short at approximately 20 days. The smallest spawnable female was 850mm total length (TL) (7.167kg.) and the smallest spawnable male was 779 mm TL (5.760kg.). Large schools of mature red drum were observed in and near the passes into the Gulf of Mexico during the spawning season indicating spawning in this area.

85-000484 Leider, S. A.; M. W. Chilcote and J. J. Loch. SPAWNING CHARACTERISTICS OF SYMPATRIC POPULATIONS OF STEELHEAD TROUT (*SALMO GAIARDNERI*): EVIDENCE FOR PARTIAL REPRODUCTIVE ISOLATION. *Can. J. Fish. Aquatic Sci.* 41(10):1454-1462. 1984. In English with French summ. SFA 30(1)
[Wash. Dep. Game, 600 North Capitol Way, Olympia, WA 98504]

85-000485 Marcus, O. and K. Kusemiju. SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY OF THE CLUPEID *ILISHA AFRICANA* (BLOCH) OFF THE LAGOS COAST, NIGERIA. *J. Fish Biol.* 25(6):679-689. 1984. SFA 30(1)
[Nigerian Inst. Oceanogr. Mar. Res., P.M.B. 12729, Lagos, Nigeria]

85-000486 Ming, F. W. and D. L. G. Noakes. SPAWNING SITE SELECTION AND COMPETITION IN MINNOWS (*PIMEPHALES NOTATUS* AND *P. PROMELAS*) (PISCES, CYPRINIDAE). *Biol. Behav.* 9(3):227-234. 1984. In English with French summ. SFA 30(1)
[Dep. Poultry Sci., Univ. British Columbia, Vancouver, BC V6T 2A2, Canada]

85-000487 Mujica R., A. and O. Rojas J. FECUNDIDAD Y ESTRUCTURA POBLACIONAL DE SARDINA COMÚN (*CLUPEA BENTINCKI* NORMAN) (CLUPEIFORMES-CLUPEIDAE). [FECUNDITY AND POPULATION STRUCTURE OF COMMON SARDINE (*CLUPEA BENTINCKI* NORMAN) (CLUPEIFORMES-CLUPEIDAE).] *Inst. Fom. Pesq. Invest. Pesq.* 31:59-69. 1984. In Spanish with English summ. SFA 30(1)
[Inst. Fom. Pesq., Casilla 1287, Santiago, Chile]

85-000488 Munekiyo, M. and A. Kuwahara. [SPAWNING GROUND, MATING SYSTEMS AND DISTRIBUTION PATTERN OF RIBBON FISH] *Bull. Jpn. Soc. Sci. Fish.* 50(9):1527-1533. 1984. In Japanese with English summ. SFA 30(1)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

85-000489 Munekiyo, M. and A. Kuwahara. [SPAWNING SEASON AND SEX RATIO OF RIBBON FISH IN THE WESTERN WAKASA BAY.] *Bull. Jpn. Soc. Sci. Fish.* 50(8):1279-1284. 1984. In Japanese with English summ. SFA 30(1)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

85-000490 Petrimoulx, H. J. OBSERVATIONS ON THE SPAWNING BEHAVIOR OF THE ROANOKE BASS. *Prog. Fish-Cult.* 46(2):120-125. 1984. SFA 30(1)
[Environmental Resources Management, Inc., P.O. Box 357, West Chester, PA 19380]

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

85-000491 Ridgway, M. S. and J. D. McPhail. ECOLOGY AND EVOLUTION OF SYMPATRIC STICKLEBACKS (*GASTEROSTEUS*): MATE CHOICE AND REPRODUCTIVE ISOLATION IN THE ENOS LAKE SPECIES PAIR. *Can. J. Zool.* 62(9):1813-1818. 1984. In English with French summ. SFA 30(1)

[Dep. Zool., Univ. West. Ont., London, ON N6A 5B7, Canada]

85-000492 St-Pierre, G. SPAWNING LOCATIONS AND SEASON FOR PACIFIC HALIBUT. *Int. Pac. Halibut Comm. Sci. Rep.* No. 70. 46p. 1984. SFA 30(1)

[Int. Pac. Halibut, Comm., Seattle, WA] Information on the reproduction of Pacific halibut (*Hippoglossus stenolepis*) is frequently needed in management decisions. This paper reviews the literature and summarizes

85-000493 Thresher, R. E. REPRODUCTION IN REEF FISHES. *Trop. Fish Hobbyist* 33(4):68-75. 1984. SFA 30(1)

85-000494 Williams, R. R. G. and G. R. Daborn. SPAWNING OF THE AMERICAN SHAD (*ALOSA SAPIDISSIMA*) IN THE ANNAPOLIS RIVER, NOVA SCOTIA. *Proc. N. S. Inst. Sci.* 34(1):9-14. 1984. In English with French summ. SFA 30(1)

[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] Plankton drift-net collections of American shad (*Alosa sapidissima*) eggs indicated that spawning in the Annapolis River, N.S., occurred from 7 May to 19 June in 1976. Spawning was related to water temperatures on the spawning grounds. Peak spawning (80% of eggs collected) occurred from 12-19 May when water temperatures were 14-15°C. Few eggs were netted at <13°C (3%) or at >18°C (1%). Spawning occurred throughout the day but most occurred during the evening and at night. Shad spawned in fresh water with the majority (98% of all egg collections) of spawning occurring >22km upstream from the tip of the salt wedge in this stratified estuary.

85-000495 Williams, R. R. G.; G. R. Daborn and B. M. Jessop. SPAWNING OF THE STRIPED BASS (*MORONE SAXATILIS*) IN THE ANNAPOLIS RIVER, NOVA SCOTIA. *Proc. N.S. Inst. Sci.* 34(1):15-23. 1984. In English with French summ. SFA 30(1)

[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] Plankton net collections of striped bass (*Morone saxatilis*) eggs in the Annapolis River, N.S., indicated that spawning occurred in early June 1983, in freshwater (<1‰ salinity) along a 19 km section of river. Spawning was closely related to water temperatures on the spawning grounds. Most spawning occurred at temperatures ≥18°C while rapid temperature drops to 15-16°C resulted in temporary cessation of spawning. Peak spawning was from 7-10 June (65% of all egg collections) when water temperatures were 19.0-24.4°C. Spawning behavior is described.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

85-000496 Edmands, F. A. II. THE DIEL DISTRIBUTION AND TRANSPORT OF ICHTHYOPLANKTON COLLECTED BY STATIONARY NETS IN NEWPORT BAY, CALIFORNIA, JULY 1979. *M.S. thesis, Calif. State Univ.* 126p. 1983. From Masters Abstr. 22(4):317. 1984. Abstract only. SFA 30(1)

SPORT FISHERY ABSTRACTS

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

85-000497 Hansen, L. P.; B. Jonsson and K. B. Doving. MIGRATION OF WILD AND HATCHERY REARED SMOLTS OF ATLANTIC SALMON, *SALMO SALAR* L., THROUGH LAKES. *J. Fish Biol.* 25(5):617-623. 1984. SFA 30(1)

[Dir. Wildl. Freshwater Fish, N-1432 AS-NLH, Norway] In 1982 and 1983 descending wild Atlantic salmon smolts, *Salmo salar* L., were caught in a fish-trap at the mouth of the River Imsa. Together with hatchery-reared smolts of the River Imsa strain they were tagged and released at three different sites of the Imsa-Lutsi watercourse: in the Imsa River 1 km above the trap, and in two lakes, 3 and 11 km upstream of the trap. The recapture-rate in the fish-trap decreased with increased migration distance. The hatchery-reared smolts migrated downstream faster than wild smolts. Lake-released smolts were considerably delayed in their downstream migration compared to the river released smolts. The results are discussed in relation to environmental and physiological parameters.

85-000498 Jaenicke, H. W.; R. D. Brodeur and T. Fujii. EXPLORATORY GILLNETTING FROM THE OSHORO-MARU FOR JUVENILE SALMONIDS OFF SOUTHEASTERN ALASKA, 24-25 JULY 1982. *Bull. Fac. Fish. Hokkaido Univ.* 35(3):154-160. 1984. SFA 30(1)

[NMFS, Auke Bay, AK 99821]

85-000499 Kelso, J. R. M. and W. H. Kwain. THE POST-SPAWNING MOVEMENT AND DIEL ACTIVITY OF RAINBOW TROUT, *SALMO GAIIRDNERI*, AS DETERMINED BY ULTRASONIC TRACKING IN BATCHAWANA BAY, LAKE SUPERIOR, ONTARIO. *Can. Field-Nat.* 98(3):320-330. 1984. SFA 30(1)

[Great Lakes Fish. Res. Br., 1219 Queen St. East, Sault Ste. Marie, ON P6A 5M7, Canada] Post-spawning movement of Rainbow Trout in Batchawana Bay of Lake Superior was examined with ultrasonic tags between 1977 and 1979. Diel activity changes dramatically from a peak between 0600 and 0900 h to an irregular low level between 1600 and 0400 h. Overall diel swimming speed, 1977-1979 inclusive, was 0.22 body lengths per second (BLs^{-1}). Swimming speeds measured between consecutive position fixes was largely 73-76% of observations, less than 1 BLs^{-1} but swimming speeds of up to 8 BLs^{-1} occurred during the dawn period of peak activity. Males re-entered the spawning stream almost three times more frequently than did females. All fish not re-entering the spawning stream oriented to the shoreline were usually within 150 m of shore and remained in shallow water (<5m) until at least mid-June. Most fish, about 90%, travelled north along the shoreline. The choice of direction may have been influenced by wind-generated currents in the bay. Tracking lasted until 1.5 months after spawning and only two fish were lost while apparently leaving Batchawana Bay.

85-000500 Kuwahara, A. and S. Suzuki. [DIURNAL CHANGES IN VERTICAL DISTRIBUTIONS OF ANCHOVY EGGS AND LARVAE IN THE WESTERN WAKASA BAY.] *Bull. Jpn. Soc. Sci. Fish.* 50(8):1285-1292. 1984. In Japanese with English summ. SFA 30(1)

[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

85-000501 Moore, S. E.; G. L. Larson and B. L. Ridley. DISPERSAL OF BROOK TROUT IN REHABILITATED STREAMS IN GREAT SMOKY MOUNTAINS NATIONAL PARK. *J. Tenn. Acad. Sci.* 60(1):1-4. 1985. SFA 30(1)

[St. John's Fish. Lab., West Melbourne, FL 32901] Attempts to eradicate exotic rainbow trout (*Salmo gairdneri*) from native brook trout (*Salvelinus fontinalis*) habitats in Great Smoky Mountains National Park

SPORT FISHERY ABSTRACTS

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

85-000501 CONTINUED streams were initiated in 1976 using electrofishing techniques. During removal operations, brook trout were fin clipped (stream section coded) and placed in small holding areas at the upstream ends of 300-m sampling sections in 1977 and 1978. When sampling was completed in each section, the fish were released. Owing to concern about possible abnormal dispersal of these brook trout, their locations were determined in 1978 and 1979. Of the adult fish recaptured, 56.2 percent were recaptured in the same (home) sections; 83.3 percent either remained home or moved only one section up or downstream. Stream channel characteristics and allopatric brook trout adjacent to the study areas appeared to affect dispersal. Nonetheless, these results are consistent with the literature, suggesting that there were no apparent abnormal effects on the movements of the brook trout from the electrofishing program. Marked young-of-the-year, recaptured as 1+, demonstrated limited movement. Some movement of adult brook trout between a tributary and its main stream was observed.

85-000502 Nezdolii, V. K. DOWNSTREAM MIGRATION OF YOUNG FISHES DURING THE INITIAL PERIOD OF FLOW REGULATION OF THE ILI RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(2):34-46. 1984. SFA 30(1)
[IEMEZH, Moscow, USSR]

85-000503 Osburn, H. R. and G. C. Matlock. BLACK DRUM MOVEMENT IN TEXAS BAYS. *N. Am. J. Fish. Manage.* 4(4B):523-530. 1984. SFA 30(1)
[Tex. Parks Wildl. Dep., P.O. Box 1717, Rockport 78382]

85-000504 Rogers, S. G.; T. E. Targett and S. B. Van Sant. FISH-NURSERY USE IN GEORGIA SALT-MARSH ESTUARIES: THE INFLUENCE OF SPRINGTIME FRESHWATER CONDITIONS. *Trans. Am. Fish. Soc.* 113(5):595-606. 1984. SFA 30(1)
[Skidaway Inst. Oceanogr., P.O. Box 13687, Savannah, GA 31416]

85-000505 Sakamoto, T. DISTRIBUTION AND MOVEMENT OF THE RED SEA BREAM IN THE WATERS OF SOUTHERN PART OF WAKAYAMA PREFECTURE, ADJACENT TO THE KII STRAIT, ASCERTAINED BY TAGGING EXPERIMENTS IN 1981. *Bull. Jpn. Soc. Sci. Fish.* 50(11):1835-1842. 1984. In Japanese with English summ. SFA 30(1)
[Wakayama Pref. Fish. Exp. Stn., Kushimoto 649-35, Japan]

85-000506 Tanaka, S. MIGRATION MODEL AND DYNAMICS PARAMETERS OF LARGE-SIZED YELLOWTAILS IN THE PACIFIC ALONG THE JAPANESE COAST INFERRED FROM TAG RECAPTURES AFTER THE YEAR OF RELEASE. *Bull. Jpn. Soc. Sci. Fish.* 50(8):1341-1347. 1984. SFA 30(1)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

FOODS/FEEDING

85-000507 Ali, A. B. THE RELATIONSHIPS BETWEEN THE STANDING STOCKS ZOOPLANKTON AND BENTHIC MACROINVERTEBRATE POPULATIONS AND FOOD HABITS OF BLUEGILLS FROM THE LITTORAL ZONE OF WEST POINT RESERVOIR, ALABAMA-GEORGIA IN 1980 AND 1981 *Ph.D. dissertation, Auburn Univ.* 155p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(4):1114. 1984. SFA 30(1)

SPORT FISHERY ABSTRACTS

FOODS/FEEDING (CONTINUED)

85-000508 Butler, S. M. and J. R. Bence. A DIET MODEL FOR PLANKTIVORES THAT FOLLOW DENSITY-INDEPENDENT RULES FOR PREY SELECTION. *Ecology* 65(6):1885-1894. 1984. SFA 30(1)

[J. R. Bence: Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

85-000509 Clarke, M. E. FEEDING BEHAVIOR OF LARVAL WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA* (PALLAS), AND THE FOOD AVAILABILITY TO LARVAL POLLOCK IN THE SOUTHEASTERN BERING SEA. *Ph.D. dissertation, Univ. Calif. (San Diego)* 1984. From Diss. Abstr. Int. B Sci. Eng. 45(5):1349. SFA 30(1)

The abundance of microcopepods, the primary food of pollock larvae, was sampled in three transects across the shelf between April and June 1981 and one transect between March and June 1980. The surveys indicate that a subsurface maximum in abundance of nauplii and small copepodites is common. The surveys also show that the oceanic domain has the highest abundance of food throughout the entire sampling period. Food abundances decrease shoreward. Observations indicate that the feeding activity of pollock larvae is similar to the behavior of most robust bodied larvae such as scombrids and is identical to the behavior described by Ellertsen et al (1980) for the cod *Gadus morhua*. Such larvae perceive food both above and below the axis of the body and can strike repeatedly at a single food particle. Results of feeding experiments conducted on shipboard with natural concentrations of food indicate that a mean feeding incidence of 34% is attained at concentrations of the nauplii of 15 per liter. These concentrations are typically available in the oceanic, middle and outer shelf regions at the depth of maximum naupliar abundance. Calculations of the energetic requirements of larvae indicate that at a concentration of 15 nauplii per liter larvae need to search between .13 and .4 liters per hour to meet their needs, depending on the size of the nauplii eaten. Growth rates of pollock larvae were determined from otoliths. Larvae from the oceanic region had the highest growth rates. This could be due to the higher concentrations of food in this domain or the higher water temperatures there. Comparisons of otoliths of unfed larvae held in the laboratory and field-caught larvae indicate that daily increments are smaller in the laboratory fish. If these small increments are used as an indicator of non-feeding fish in the field, then only about 28% of the larvae at the size for first feeding were not feeding.

85-000510 Coleman, N. and M. Mobley. DIETS OF COMMERCIALY EXPLOITED FISH FROM BASS STRAIT AND ADJACENT VICTORIAN WATERS, SOUTH-EASTERN AUSTRALIA. *Aust. J. Mar. Freshwater Res.* 35(5):549-560. 1984. SFA 30(1)

[Mar. Sci. Lab., P.O. Box 114, Queenscliff, Victoria 3225, Australia]

85-000511 De Silva, S. S.; M. K. Perera and P. Maitipe. THE COMPOSITION, NUTRITIONAL STATUS AND DIGESTIBILITY OF THE DIETS OF *SAROTHERODON MOSSAMBICUS* FROM NINE MAN-MADE LAKES IN SRI LANKA. *Environ. Biol. Fishes* 11(3):205-219. 1984. SFA 30(1)

[Dep. Zool., Univ. Ruhuna, Motara, Sri Lanka]

85-000512 Ellison, D. G. TROPHIC DYNAMICS OF A NEBRASKA BLACK CRAPPIE AND WHITE CRAPPIE POPULATION. *N. Am. J. Fish. Manage.* 4(4A):355-364. 1984. SFA 30(1)

[Lake McConaughy Fish. Res. Lab., Nebr. Game Parks Comm., Ogallala 69153]

85-000513 Felley, J. D. PISCIVOROUS HABITS OF THE CHUB SHINER, *NOTROPIS POTTERI* (CYPRINIDAE). *Southwest Nat.* 29(4):495-496. 1984. SFA 30(1)

[Dep. Biol., McNeece State Univ., Lake Charles, LA 70609]

SPORT FISHERY ABSTRACTS

FOODS/FEEDING (CONTINUED)

- 85-000514 Finger, T. E. and Y. Morita. FEEDING MECHANISMS IN GOLDFISH -- SPECULATIONS ON THE LAMINAR ORGANIZATION OF THE VAGAL LOBE. *Am. Zool.* 24(3):114A. 1984. Abstract only. SFA 30(1)
[Univ. Colo. Med. Sch., Denver]
- 85-000515 Fowler, J. FOOD HABITS AND FEEDING OF STONEROLLER MINNOWS IN SOUTHWEST MISSOURI. *Trans. Mo. Acad. Sci.* 17:196. 1983. Abstract only. SFA 30(1)
[Southwest Mo. State Univ., Springfield 65804]
- 85-000516 Fraser, D. F. and T. N. Mottolese. DISCRIMINATION AND AVOIDANCE REACTIONS TOWARDS PREDATORY AND NONPREDATORY FISH BY BLACKNOSE DACE, *RHINICHTHYS ATRATULUS* (PISCES: CYPRINIDAE). *J. Comp. Ethol.* 66(2):89-100. 1984. SFA 30(1)
[Dep. Biol., Siena Coll., Loudonville, NY 12211] The hypothesis that blacknose dace *Rhinichthys atratulus* discriminate between piscivorous creek chub *Semotilus atromaculatus* and nonpiscivorous common suckers *Catostomus commersoni* was tested in a seminatural, artificial stream. Dace avoided the nonpredatory suckers less than they did the predatory chub, which they avoided during both day and night. However, dace significantly avoided the nonpredator at night. Further, experienced and inexperienced dace avoided the nonpredator similarly, suggesting that they had not learned to discriminate predator from nonpredator in their natural habitat. These results are consistent with two hypotheses (1) that individuals varied in ability to discriminate predatory from nonpredatory fishes, and (2) that the predator was more active than the nonpredator, thereby "frightening" the dace more. At temperatures of <6°C the nonpredator was inactive and dace no longer avoided it at night, but continued to avoid the active chub, suggesting that movement constituted part of the avoidance-releasing stimulus. Because dace avoided nonpredators, they may waste time in natural streams avoiding harmless fish. It is suggested that the dace cannot afford the risk of a mistaken identity, which may be high in the stream environment, and selection favors those that avoid all large, moving fish.
- 85-000517 Gore, M. A. FACTORS AFFECTING THE FEEDING BEHAVIOR OF A CORAL REEF FISH, *CHAETODON CAPISTRATUS*. *Bull. Mar. Sci.* 35(2):211-220. 1984. SFA 30(1)
[Sub-Dep. Anim. Behav., Univ. Cambridge, Madingley, Cambridge CB3 8AA, England]
- 85-000518 Grimm, A. J. A FEEDING COMPARISON OF SCULPINS AND BROWN TROUT IN THE NORTH FORK OF THE WHITE RIVER. *Trans. Mo. Acad. Sci.* 17:196. 1983. Abstract only. SFA 30(1)
[Biol. Dep., Cent. Mo. State Univ., Warrensburg 64093]
- 85-000519 Kelso, W. E. TROPHIC OVERLAP AND COMPETITION AMONG JUVENILE LITTORAL FISHES IN CLAYTOR LAKE, VIRGINIA. *Ph.D. dissertation, VPI&SU* 322p. 1983. From Diss. Abstr. Int. B Sci. Eng. 45(4):1103. 1984. SFA 30(1)
Food habits of juvenile littoral fishes in Claytor Lake were analyzed to determine if cohabiting species compete. Feeding periodicity, diet composition, food item electivities, diet breadth, and prey size-selectivity were determined for six species. Based on analyses of trophic overlap, four species were subsequently used in field enclosure experiments to assess

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FOODS/FEEDING (CONTINUED)

85-000519 CONTINUED impacts of interspecific interactions on food selection and growth. Bluegill, pumpkinseed, yellow perch, and smallmouth bass fed primarily during morning and late afternoon, whereas spotted bass fed evenly during all diurnal periods. Alewives differed from other species, feeding continually throughout the night. Bluegill, pumpkinseed, yellow perch, and spotted bass foraged extensively in benthic and vegetated habitats, with high electivities for large vegetation-dwelling cladocerans. Postlarval smallmouth bass and alewives foraged in open water, with high electivities for pelagic cladocerans. Comparisons of ambient and ingested zooplankton length distributions revealed significant differences for all six fishes. Transformation of ambient zooplankton length distributions by a differential visibility foraging model indicated that factors other than apparent size determined prey selectivity for all species except yellow perch. Calculations indicated substantial overlap in prey size-selectivity and feeding periodicity for all species except alewife. Bluegill and pumpkinseed exhibited consistently high diet overlaps, while overlap values were low among yellow perch, spotted bass, smallmouth bass, and alewife, providing the only observed trophic segregation. Field enclosure experiments with bluegill and pumpkinseed revealed competition that resulted in altered diet composition and reduced growth of bluegill. Other two-species experiments (bluegill or pumpkinseed with spotted bass or yellow perch) produced no such changes. Whereas interspecific competition may reduce bluegill fishery potential, competition probably does not affect growth of other juvenile littoral fishes at normal densities.

85-000520 Knight, R. L.; F. J. Margraf and R. F. Carline. PISCIVORY BY WALLEYES AND YELLOW PERCH IN WESTERN LAKE ERIE. *Trans. Am. Fish. Soc.* 113(6):677-693. 1984. SFA 30(1)
[Ohio Div. Wildl., P.O. Box 650, Sandusky 44870]

85-000521 Kratz, K. W. AN ANALYSIS OF PREY SELECTION BY THE PIUTE SCULPIN (*COTTUS BELDINGI*): AN AMBUSH PREDATOR. *M.S. thesis, Univ. Nev. (Reno)* 81p. 1983. From Masters Abstr. 22(4):329. 1984. Abstract only. SFA 30(1)

[Studies conducted in laboratory streams investigated prey selection by the Piute sculpin (*Cottus beldingi*), an ambush predator. Independent 24 hour single and multiple prey species feeding trials using single fish were replicated at densities of 25, 50, and 100 prey m⁻², with an additional density of 200 m⁻² in the multiple species trials. Selection was not correlated with prey size at any density in single or multiple species trials. Prey size selection was correlated with abundance in single species trials. Differential rates of predation by sculpin on the prey species was not observed at the lowest prey density. With increasing density the amphipod, *Gammarus lacustris*, suffered the greatest predation followed by the stonefly nymph, *Arcynopteryx californicus*, and the mayfly nymph, *Ephemerella drunella*. In multiple species trials the relative contribution of each species in the sculpin diet was not significantly altered despite a 700% increase in absolute prey abundance.

85-000522 Kruse, K. C. and B. M. Stone. LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) LEARN TO AVOID FEEDING ON TOAD (*BUFO*) TADPOLES. *Anim. Behav.* 32(4):1035-1039. 1984. SFA 30(1)

[Dep. Zool., East Ill. Univ., Charleston, IL 61920] Largemouth bass (*Micropterus salmoides*), when starved for 1 day, almost totally abstain from eating toad (*Bufo americanus* and *Bufo woodhousei*) tadpoles. However, there is a positive relationship between bass hunger levels and the acceptability of *Bufo* larvae as food items. With experience, there is a decrease in the number of toad tadpoles engulfed (taken into the mouth), and

FOODS/FEEDING (CONTINUED)

85-000522 CONTINUED that actually consumed by bass, while the number of larvae expelled (spat out) increases. Bass strongly prefer *Hyla crucifer* tadpoles to *B. americanus* larvae, and learn to distinguish between the two species. These results agree with the hypothesis that the schooling behaviour found in *B. americanus* tadpoles functions, at least in part, as a deterrent to predation.

85-000523 Lockwood, S. J. THE DAILY FOOD INTAKE OF 0-GROUP PLAICE (*PLEURONECTES PLATESSA* L.) UNDER NATURAL CONDITIONS: CHANGES WITH SIZE AND SEASON. *J. Cons. Int. Explor. Mer* 41(2):181-193. 1984. SFA 30(1)

[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England] Samples of 0-group plaice collected in Filey Bay, Yorkshire, during July and September-October 1969 were analysed to estimate their daily food intake by 5 mm length groups. In July there was a linear relationship between daily food intake and body weight, equivalent to 10% whole body weight per day over the size range 18 mm to 49 mm. In the autumn when the fish examined were 40 mm to 80 mm, the relative food intake fell to 1.5% body weight per day, but it is not certain that the relation between daily food intake and body weight was linear. The change in diet of 0-group plaice is described in relation to the size of the fish. It is concluded that diet changes to maintain an optimal prey size between 0.5% and 10% of the predators' weight. This change in diet keeps to a minimum the number of prey organisms required each day and, due to the falling relative feeding rate with increase in mean size, explains why larger fish in the population are more likely to have empty stomachs than small fish. Metamorphosing plaice larvae are shown to cease feeding for more than 24 to 36 hours. This may be due either to fewer attacks, or fewer successful attacks resulting from a changing eye-mouth configuration.

85-000524 Manooch, C. S. III; D. L. Mason and R. S. Nelson. FOOD AND GASTROINTESTINAL PARASITES OF DOLPHIN *CORYPHAENA HIPPURUS* COLLECTED ALONG THE SOUTHEASTERN AND GULF COASTS OF THE UNITED STATES. *Bull. Jpn. Soc. Sci. Fish.* 50(9):1511-1525. 1984. SFA 30(1)

[NMFS, Beaufort, NC 28516-9722]

85-000525 McCormick, J. H. and H. A. Podoliak. GALLBLADDER COLOR AND RELATIVE FULLNESS AS A FIELD TECHNIQUE FOR ESTIMATING TIME SINCE LAST FEEDING IN BROOK TROUT. *N. Am. J. Fish. Manage.* 4(4B):566-568. 1984. SFA 30(1)

[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

85-000526 McLennan, J. A. and B. W. H. MacMillan. THE FOOD OF THE RAINBOW AND BROWN TROUT IN THE MOHAKA AND OTHER RIVERS OF HAWKE'S BAY, NEW ZEALAND. *N. Z. J. Mar. Freshwater Res.* 18(2):143-158. 1984. SFA 30(1)

[Ecol. Div., Dep. Sci. Indus. Res., Goddards Lane, Havelock North, New Zealand]

85-000527 Mikheev, V. N. PREY SIZE AND FOOD SELECTIVITY IN YOUNG FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(2):66-76. 1984. SFA 30(1)

[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., Acad. Sci. USSR, Moscow, USSR] The maximum prey size in young roach, *Rutilus rutilus* feeding on zooplankton, is determined by the size of the mouth and is closely correlated with it ($r = 0.98$; $P = 0.999$). The minimum prey size does not change with increase in fish length from 12.6 to 20 mm. Two peaks of food selectivity were observed in the experiments on juvenile *Brachydanio rerio* feeding upon *Daphnia magna*. The peaks are formed sequentially,

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FOODS/FEEDING (CONTINUED)

85-000527 CONTINUED first, as a result of selection of larger prey and subsequently due to changeover to the small prey objects, which are consumed several dozens of times faster than the larger organisms. Energy intake per unit time in this case increases.

85-000528 Mills, E. L.; J. L. Confer and R. C. Ready. PREY SELECTION BY YOUNG YELLOW PERCH: THE INFLUENCE OF CAPTURE SUCCESS, VISUAL ACUITY, AND PREY CHOICE. *Trans. Am. Fish. Soc.* 113(5):579-587. 1984. SFA 30(1)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

85-000529 Morin, P. J. ODNATE GUILD COMPOSITION: EXPERIMENTS WITH COLONIZATION HISTORY AND FISH PREDATION. *Ecology* 65(6):1866-1873. 1984. SFA 30(1)
[Dep. Biol. Sci., Nelson Biol. Lab., P.O. Box 1059, Rutgers Univ., Piscataway, NJ 08854]

85-000530 O'Brien, W. J.; B. Loveless and D. Wright. FEEDING ECOLOGY OF YOUNG WHITE CRAPPIE IN A KANSAS RESERVOIR. *N. Am. J. Fish. Manage.* 4(4A):341-349. 1984. SFA 30(1)
[Dep. Syst. Ecol., Univ. Kans., Lawrence 66045]

85-000531 Post, J. R. and D. Cucin. CHANGES IN THE BENTHIC COMMUNITY OF A SMALL PRECAMBRIAN LAKE FOLLOWING THE INTRODUCTION OF YELLOW PERCH, *PERCA FLAVESCENS*. *Can. J. Fish. Aquatic Sci.* 41(10):1496-1501. 1984. In English with French summ. SFA 30(1)
[Dep. Biol., York Univ., 4700 Keele St., Downsview, ON M3J 1P3, Canada]

85-000532 Roberts, D. A.; E. E. DeMartini and K. M. Plummer. THE FEEDING HABITS OF JUVENILE-SMALL ADULT BARRED SAND BASS (*PARALABRAX NEBULIFER*) IN NEARSHORE WATERS OFF NORTHERN SAN DIEGO COUNTY. *Calif. Coop. Oceanic Fish. Invest. Rep.* 25:105-111. 1984. In English with Spanish summ. SFA 30(1)
[Mar. Rev. Comm. Res. Cent., 531 Encinitas Blvd., Encinitas CA 92024] The feeding habits of juvenile-small adult barred sand bass (*Paralabrax nebulifer*) are described, based on 165 specimens 123-523 mm standard length (SL) collected between San Onofre and Oceanside, California, at depths ranging from 8 to 30 m. Collections were made during an annual cycle from March 1981 to March 1982. The diet of the barred sand bass indicates that it forages in close proximity to the substrate. Brachyuran crabs, mysids, pelecypods, and epibenthic fishes were the most important prey. These findings are contrary to previous studies, which found northern anchovy (*Engraulis mordax*) to be of major importance in the diet of similar-sized bass. Three functional foraging categories were identified based on body size. The diet of small (< 240 mm SL) barred sand bass was unique because it included crustaceans such as mysids and gammarid amphipods, whereas large (> 320 mm SL) barred sand bass consumed larger prey such as *Parichthys notatus* (80-160 mm SL) and *Octopus*. Bass of intermediate size (240-320 mm SL) contained the species found in both large and small fish. The temporal and spatial aspects of *Paralabrax nebulifer*'s feeding niche are distinct from those of the other demersal fishes of shallow, soft-bottom habitats in the Southern California Bight. These differences are discussed.

FOODS/FEEDING (CONTINUED)

85-000533 Rowe, D. K. FACTORS AFFECTING THE FOODS AND FEEDING PATTERNS OF LAKE-DWELLING RAINBOW TROUT (*SALMO GAIRDNERII*) IN THE NORTH ISLAND OF NEW ZEALAND. *N. Z. J. Mar. Freshwater Res.* 18(2):129-141. 1984. SFA 30(1)

[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 951, Rotorua, New Zealand] Differences in feeding between age classes, males and females, and hatchery reared and wild rainbow trout (*Salmo gairdnerii*) in Lake Rotoma are described. Analysis of results, in conjunction with other published data on trout foods and feeding, showed that there was a summer increase in epibenthic feeding which, in Lake Rotoma, was most apparent in the species of forage fish predated. When trout feeding on forage fish was examined in a variety of lakes, 2 trends emerged. In large, clear, oligotrophic lakes trout fed predominantly on smelt (*Retropinna retropinna*) which are shoaling, epipelagic fish. Trout in small turbid lakes fed mainly on the solitary, benthic bully (*Gogiomorphus cotidianus*). These differences in feeding on forage fish were associated with the effects of water temperature and turbidity on trout distribution and foraging behaviour.

85-000534 Ryan, P. A. DIET AND SEASONAL FEEDING ACTIVITY OF THE SHORT-FINED EEL, *ANGUILLA AUSTRALIS SCHMIDTII*, IN LAKE ELLESMERE, CANTERBURY, NEW ZEALAND. *Environ. Biol. Fishes* 11(3):229-234. 1984. SFA 30(1)

[Zool. Dep., Univ. Canterbury, Christchurch, New Zealand] Eel samples from Lake Ellesmere, a brackish water lake in the South Island, New Zealand, were taken at approximately monthly intervals from January 1974 to April 1976. Nets were set for 24 h and emptied every three hours. Total lengths and stomach fullness values of 498 eels were recorded. Analysis using the non-parametric Kruskal-Wallis test showed that eels ≤ 40 cm and 40.1-50 cm in length increased in fullness through the night with greatest fullness values at 0300 and 0600 h. Seasonal analyses revealed greatest eel activity in spring, summer and autumn. There was little eel activity in winter.

85-000535 Sanderson, S. L. PREY CAPTURE IN TROPHICALLY SPECIALIZED AND GENERALIZED FISH. *Am. Zool.* 24(3):106A. 1984. Abstract only. SFA 30(1)

[Harvard Univ., Cambridge, MA]

85-000536 Spencer, C. N. and D. L. King. ROLE OF FISH IN REGULATION OF PLANT AND ANIMAL COMMUNITIES IN EUTROPHIC PONDS. *Can. J. Fish. Aquatic Sci.* 41(12):1851-1855. 1984. In English with French summ. SFA 30(1)

[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824-1222]

85-000537 Sumida, B. Y. and H. G. Moser. FOOD AND FEEDING OF BOCACCIO (*SEBASTES PAUCISPINIS*) AND COMPARISON WITH PACIFIC HAKE (*MERLUCCIIUS PRODUCTUS*) LARVAE IN THE CALIFORNIA CURRENT. *Calif. Coop. Oceanic Fish. Invest. Rep.* 25:112-118. 1984. In English with Spanish summ. SFA 30(1)

[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] The composition of the diet of larval bocaccio (*Sebastes paucispinis*) and Pacific hake (*Merluccius productus*) overlapped in copepod types and developmental stages, but important differences were evident from gut content analyses of specimens collected in 1975 CalCOFI cruises. Both bocaccio and Pacific hake larvae have large mouths, but first-feeding bocaccio preyed on smaller organisms than first-feeding hake (30-170 μ m wide vs 40-350 μ m in hake). Compared with small hake larvae, early stages of bocaccio ingested a greater diversity of food types including larval euphausiids, diatoms, dinoflagellates, tintinnids, and cladocerans. Although copepod nauplii constituted the dominant prey in bocaccio larvae less than 7.0 mm long, there was a total lack of adult copepods and very low incidence of copepodites in the diet. In contrast, adult copepods, primarily calanoids, made up a significant portion of the diet in all sizes of hake larvae examined,

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85-000537 CONTINUED contributing about 74% of overall prey volume compared to about 33% in 7-13 mm bocaccio larvae. Observations of feeding incidence in relation to time of capture suggested a faster rate of gut evacuation in bocaccio larvae.

85-000538 Tomcko, C. M.; R. A. Stein and R. F. Carline. PREDATION BY TIGER MUSKELLUNGE ON BLUEGILL: EFFECTS OF PREDATOR EXPERIENCE, VEGETATION, AND PREY DENSITY. *Trans. Am. Fish. Soc.* 113(5):588-594. 1984. SFA 30(1)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

85-000539 Tricas, T. C. FOODS, FOES, AND PHYSIOLOGY: AN EXPERIMENTAL ANALYSIS OF OPTIMAL FEEDING-TERRITORY SIZE. *Am. Zool.* 24(3):102A. 1984. Abstract only. SFA 30(1)

[Univ. Hawaii at Manoa, Honolulu]

85-000540 Walsh, G. and G. J. FitzGerald. RESOURCE UTILIZATION AND COEXISTENCE OF THREE SPECIES OF STICKLEBACKS (*GASTEROSTEIDAE*) IN TIDAL SALT-MARSH POOLS. *J. Fish Biol.* 25(4):405-420. 1984. SFA 30(1)

[Dep. Biol., Univ. Laval, Ste-Foy, PQ G1K 7P4, Canada] Food resource partitioning in a community consisting of three sticklebacks (*Gasterosteidae*) was studied in a tidal salt-marsh near Isle Verte, Québec in the St Lawrence Estuary. From May to July 1981 stomachs of all species were analysed. In general four prey items composed greater than 70% of the diet. There were differences in the relative proportions of prey items eaten between the sexes and species and on the different sampling dates, indicating resource partitioning. However, experiments, where allopatric and sympatric populations were established in tidal pools, did not reveal any significant shift in either type of prey or size of prey consumed, suggesting that food competition was unimportant. Microhabitat partitioning was also observed between the three species which may have served to reduce interspecific competition for food.

85-000541 Zama, A.; T. Rueda L. and E. Cárdenas G. UNUSUAL ARRIVAL OF CHUB MACKEREL *SCOMBER JAPONICUS* AT PUERTO CHACABUCO, SOUTHERN CHILE (PISCES: SCOMBRIDAE). *Rev. Biol. Mar.* 20(1):61-76. 1984. In English with Spanish summ. SFA 30(1)

[SERNAP, Edif. Obras Publ., Piso 20, Ribera Sur, Puerto Aysén, Chile]

AGE AND GROWTH

85-000542 Aguayo H., M. and R. Gili V. EDAD Y CRECIMIENTO DE MERLUZA DE COLA (*MACRURONUS MAGELLANICUS*, LÖNNBERG) (GADIFORMES-GADIDAE). [AGE AND GROWTH OF HAKE TAIL (*MACRURONUS MAGELLANICUS*, LÖNNBERG) (GADIFORMES-GADIDAE).] *Inst. Fom. Pesq. Invest. Pesq.* 31:47-57. 1984. In Spanish with English summ. SFA 30(1)

[Inst. Fom. Pesq., Casilla 1287, Santiago, Chile]

85-000543 Baranova, V. V. GROWTH OF ROACH, *RUTILUS RUTILUS* (CYPRINIDAE), IN THE RESERVOIRS OF THE UPPER VOLGA BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 24(2):77-82. 1984. SFA 30(1)

[GosNIORKH, Konakovo, USSR]

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AGE AND GROWTH (CONTINUED)

85-000544 Bejarano, R. and V. Guillory. LENGTH-FREQUENCY DISTRIBUTION, SIZE, AND CONDITION OF GULF MENHADEN COLLECTED FROM THREE LOUISIANA REDUCTION PLANTS. *La. Dep. Wildl. Fish. Mar. Res. Lab. Tech. Bull.* No. 38. 1-8. 1984. SFA 30(1)

[La. Mar. Res. Lab., Grand Isle, LA]

85-000545 Boehlert, G. W. and M. M. Yoklavich. VARIABILITY IN AGE ESTIMATES IN *SEBASTES* AS A FUNCTION OF METHODOLOGY, DIFFERENT READERS, AND DIFFERENT LABORATORIES. *Calif. Fish Game* 70(4):210-224. 1984. SFA 30(1)

[NMFS, P.O. Box 3830, Honolulu, HI 96812] Age was determined in the fast growing canary rockfish, *Sebastes pinniger*, and the slow growing splitnose rockfish, *S. diploproa*, by different laboratories, techniques, and readers. Variability between agencies depended upon method and species. For *S. pinniger* aged by both laboratories, whole otolith ages were similar, whereas the otolith section ages greatly exceeded those of whole otolith ages. Clear differences were noted for the slower growing *S. diploproa*; whole otolith ageing methods differed between the two laboratories, with much greater ages for larger specimens assigned by one laboratory. These older whole otolith ages showed similarities to the otolith section ages for this species, but still did not reveal the longevity noted with sections. We suggest two areas where improvement in precision of age determination is necessary. First, a consensus on ageing methodology (whole versus sectioned or broken and burned otoliths) is necessary to allow meaningful comparisons between readers. Secondly, mechanisms to allow comparisons between agencies or laboratories are necessary to provide ages which are, at the least, consistent, for use by fisheries managers.

85-000546 Brennan, J. S. TECHNIQUES FOR AGEING STURGEON: A COMPARATIVE ANALYSIS. *Am. Zool.* 24(3):26A. 1984. Abstract only. SFA 30(1)

[Moss Landing Mar. Lab., Moss Landing, CA] Sturgeon fisheries worldwide have a history of overexploitation and mismanagement. To properly manage such an economically important fishery information on age, growth and reproduction are essential. This study compared five bony structures of the white sturgeon (*Acipenser transmontanus*) to determine the most accurate and precise technique for ageing. Annuli were counted on otoliths, scutes, opercles, cleithra, and fin ray sections using x-radiography, scanning electron microscopy, clearing and staining, and other ageing techniques. Depositional patterns were verified by comparing different structures. The results of these in-progress studies will be discussed.

85-000547 Campana, S. E. MICROSTRUCTURAL GROWTH PATTERNS IN THE OTOLITHS OF LARVAL AND JUVENILE STARRY FLOUNDER, *PLATICHTHYS STELLATUS*. *Can. J. Zool.* 62(8):1507-1512. 1984. In English with French summ. SFA 30(1)

[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

85-000548 Dobson, S. H. and R. M. Holmes. COMPENSATORY GROWTH IN THE RAINBOW TROUT, *SALMO GAIIRDNERI* RICHARDSON. *J. Fish Biol.* 25(6):649-656. 1984. SFA 30(1)

[Univ. Manchester, Dep. Chem. Pathol., Hope Hospital, Eccles Old Rd., Salford M6 8HD, England]

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[S. A. K. Nasar: Fish Ecol. Lab., Dep. Zool., North-Eastern Hill Univ., Shillong 793014, Meghalaya, India]

85-000552 Kimura, S. AGE AND GROWTH OF THREELINE GRUNT *PARAPRISTIPOMA TRILINEATUM* ESTIMATED BY OTOLITH READING. *Bull. Jpn. Soc. Sci. Fish.* 50(11):1843-1847. 1984. In Japanese with English summ. SFA 30(1)
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85-000553 Kristinsson, J. B. FACTORS INFLUENCING GROWTH OF JUVENILE ATLANTIC SALMON. *Ph.D. dissertation, Univ. New Brunswick (Canada)* 1984. From Diss. Abstr. Int. B Sci. Eng. 45(4):1093. 1984. SFA 30(1)

Growth dynamics of individually marked juvenile Atlantic salmon (*Salmo salar* L.) were examined during the development of bimodality in their length frequency distribution. All the fish grew at similar rates until August/September. Then the segregation into the two modes began as larger fish which had reached 8-12 cm fork length entered a phase of greatly increased growth rate. More fish entered this faster growing phase as long as the temperature was above 10°C. A few mature males entered this phase at temperatures below 10°C. These faster growing fish comprised the upper mode. The effects of temperature and photoperiod on mean size and proportions of fish in the two modes were studied together with the relationship between sexual maturation of male parr and bimodality. Groups in which the temperature was maintained high in late summer had larger proportions of fish in the upper mode than those in which the temperature fell earlier. A long photoperiod before the segregation began increased the proportion of fish in the upper mode whereas long and increasing photoperiod during the segregation appeared to decrease the proportion in the upper mode. An 8-h photoperiod during spring and summer of the second year appeared to allow female and immature male, lower mode parr to enter the faster growing phase while this did not occur in a simulated natural photoperiod control group. Mature males were conspicuously dominant in the lower mode both during the segregation (autumn) and in the following year. A mutual inhibitory relationship was apparent between the development of sexual maturity in male parr and entrance into the faster growing phase. The mean plasma thyroxine level of upper mode fish was significantly higher than that of the lower mode fish (December).

85-000554 Kuo, C. and S. Tanaka. OTOLITH FEATURES AND RELIABILITY FOR AGE-DETERMINATION OF HOKI *MACRURONUS NOVAEZEELANDIDAE* (HECTOR) IN WATERS AROUND NEW ZEALAND. *Bull. Jpn. Soc. Sci. Fish.* 50(8):1349-1355. 1984. SFA 30(1)

[Dep. Fish. Biol., Taiwan Fish. Res. Inst., Keelung, Taiwan, ROC] The otolith was composed of dark nucleus, light hyaline zones and dark opaque zones when observed in direct light. Pattern of otolith was divided into six types according to the clearness of the hyaline and opaque zones. The comparisons of frequency distribution of types were made and no difference

AGE AND GROWTH (CONTINUED)

85-000554 CONTINUED was observed between the NORTHWEST region and the SOUTH region. However, difference was found between the above two regions and the EAST region. The reliability of the otolith for age-determination was discussed. Although the readability varied with total length and otolith types, the corresponding rings showed regularity in positions. Also, the ring radius and the number of rings increased with total length and they are considered to be formed with the growth of fish. Two independent readings of otolith agreed reasonably. Therefore, the otolith was thought to be useful for the age determination of individual fish.

85-000555 Leong, R. GROWTH OF JACK MACKEREL, *TRACHURUS SYMMETRICUS*, IN CAPTIVITY. *Calif. Coop. Oceanic Fish. Invest. Rep.* 25:146-150. 1984. In English with Spanish summ. SFA 30(1)

[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] Fishery data indicate that jack mackerel captured from inshore waters are seldom more than 380 mm in fork length (FL). This laboratory study shows that the inshore fish have the potential to grow as large as 425-450 mm FL. During a 2-year period laboratory-held mackerel grew more than three times faster in length and more than five times faster in weight than fish in the wild. Most of the surplus weight (65%) was fat, but a significant portion (26%) was fat-free dry weight, indicating that protein as well as fat was stored. The high levels of fat and protein accumulated by the laboratory fish indicate that the growth in length (skeletal growth) may have been near the maximum rate. The excess fat was deposited in the red and white muscles and viscera in different proportions.

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85-000557 McEwan, A. and T. Hecht. AGE AND GROWTH OF THE LONGFIN EEL, *ANGUILLA MOSSAMBICA* PETERS, 1852 (PISCES: ANGUILLIDAE) IN TRANSKEI RIVERS. *South Afr. J. Zool.* 19(4):280-285. 1984. SFA 30(1)

[Dep. Ichthyol. Fish. Sci., Rhodes Univ., Grahamstown, South Africa] Otoliths were successfully used for age determination and growth-rate calculation of the longfin eel, *Anguilla mossambica* Peters, 1852. The large opaque nucleus of the otoliths represents the leptocephalid stage and probably lasts from one and a half to two years. Thereafter, one opaque and one hyaline zone is deposited on the otoliths per year. *A. mossambica* in Transkei rivers have a slow growth rate and remain in fresh water for up to 18 years, during which they attain a maximum length of about 1000 mm. The growth of the eels, ranging from 99-1004 mm total length, is isometric and is described by the equation $L_t(\text{mm}) = 1390(1 - e^{-0.041(t+0.476)})$. The length/weight relationship is

represented by $W(g) = 7.143 \times 10^{-4} L(\text{cm})^{3.2998}$, and somatic growth can be expressed by the equation $W_t(g) = 8418 (1 - e^{-0.041(t+0.476)})^{3.2998}$

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[Ill. Nat. Hist. Surv., R.R. #1, Box 157, Sullivan 61951]

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[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Hakodate, Hokkaido 041, Japan]

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[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] The coefficient H of the growth equation $dw/dt = Hw^m - kw^n$ is interpreted as indicating the satiation level achieved. H tended to be highest in medium-sized cod of several stocks. Relating H to food concentration in the North Sea indicated that most cod stocks are almost satiated when H is maximum. This occurs at body weights to which fish food is most plentiful. Closest to satiation are Faroe Bank cod. Calculations were performed with two sets of values of m , n and k , one estimated from growth rates, another from respiration rates of fed and fasting cod. Although markedly different the two sets of values led to almost the same conclusions except when daily rations were calculated.

85-000564 Welden, B. A. LEAD-210 IN ELASMOBRANCHS: A TOOL FOR THE STUDY OF AGE, GROWTH AND METABOLISM. *Am. Zool.* 24(3):27A. 1984. Abstract only. SFA 30(1)

[Moss Landing Mar. Lab., Moss Landing, CA] Levels of the naturally occurring radionuclide lead-210 were analyzed from calcified cartilage of three species of elasmobranchs from California, the Pacific angel, common thresher, and white sharks. These data were used to estimate age, determine growth rates, interpret calcification processes, and identify changes in habitat with age. Lead-210 age estimates indicate slow growth in the white shark, a relatively active species, and faster growth in the Pacific angel, a sluggish benthic species. Uptake and retention of lead-210 and its relationship to calcium varied among the three species, reflecting their different life history patterns, activity levels and presumed metabolic rates. Lead-210 levels in young versus old individuals of the common thresher and white sharks correlate with their hypothesized movement from shallow, nearshore pupping grounds, to pelagic habitats.

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[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824] The effect of food ration on larval lake whitefish, *Coregonus clupeaformis*, growth and survival was determined in the laboratory using brine shrimp as the test prey. In replicate experiments, larval whitefish were fed one of seven different rations of brine shrimp over a 25 day period. Statistically significant differences were found between larval growth and survival at each feeding level. Larvae fed to excess were 1.33 times as long and 2.80 times as heavy as those on the 1.8 zooplankton/fish (z/f) ration. No mortality was recorded until after day 15 of the experiment by which time all larvae had resorbed their yolk sac. Total mortality followed within 1 week for all feeding densities with the exception of the three highest (18 z/f, 32 z/f and excess rations) where total mortality equalled 90%, 12% and 0%, respectively.

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[Buchenweg 11, D-2117 Tostedt, West Germany] Once a common species, the salmon has completely disappeared from the regulated River Elbe since the beginning of the century. However, tributaries of the lower Elbe are able to support stocks of threatened fish species, including such salmonids as brown trout, grayling, and in special cases, sea trout. All these depend for survival on man's activities, such as breeding larvae and improving spawning grounds. Taking two small streams of the Lüneburger Heide area as examples, it is shown that grayling could hardly survive without continuous stocking. This is also true of sea trout, an anadromous fish. The extremely bad water quality in the River Elbe during years of low water levels results in an almost complete failure of adult fishes to reach spawning grounds upstream from the Port of Hamburg. Downstream, there are shallow water areas that serve as pathways for fish to reach tributaries downstream of Hamburg. Improved water quality in the Elbe can be expected after the construction of better sewage treatment plants. The spawning streams, however, may be threatened by increasing ground water extractions.

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[N.Y. Dep. Environ. Conserv., Stanford, NY 12167] Larval sturgeon, *Scaphirhynchus* spp. and *Acipenser fulvescens*, from river systems of the central United States, were examined and compared to find the best distinguishing characters. Those characters selected were pigmentation, size, and total myomere count. Lake sturgeon, *Acipenser fulvescens*, larvae were darker, larger, and had more myomeres than *Scaphirhynchus* spp. larvae. For individuals less than 16 mm total length, total myomere count was important for identification; total myomeres were 55-59 (mean of 57) for lake sturgeon and 50-53 (mean of 52) for *Scaphirhynchus* spp. Some *Scaphirhynchus* spp. specimens were identified as shovelnose sturgeon (*S. platyrhynchus*) because of their collection location, but others could not be identified to species because they came from areas where both shovelnose sturgeon and pallid sturgeon (*S. albus*) occur.

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[J. B. Gratzek: Dep. Med. Microbiol., Coll. Vet. Med., Univ. Ga., Athens 30602] An ozone-containing, activated air oxidant, called Photozone, was tested *in vitro* and *in vivo* for its effects on selected bacteria and protozoa in a closed aquatic system. Studies *in vitro* showed *Aeromonas hydrophila*, *Escherichia coli* and *Staphylococcus aureus* to be rapidly inactivated in distilled water when treated with Photozone, whereas the presence of 100 mg L⁻¹ of dextrose as dissolved organic carbon (DOC) delayed destruction. Studies *in vivo* showed a significant ($P < 0.0005$) reduction of total circulating bacteria (including *A. hydrophila*) in aquaria during Photozone treatment. The oxidant was effective in destroying the ciliate *Tetrahymena pyriformis* *in vitro*, both in the presence and absence of DOC, but was ineffective in preventing the spread and/or development of ichthyophthiriasis ("white spot" disease) in channel catfish (*Ictalurus punctatus* (Rafinesque)) *in vivo*.

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85-000739 Lemly, A. D. and G. W. Esch. POPULATION BIOLOGY OF THE TREMATODE *UVULIFER AMBLOPLITIS* (HUGHES, 1927) IN JUVENILE BLUEGILL SUNFISH, *LEPOMIS MACROCHIRUS*, AND LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*. *J. Parasitol.* 70(4):466-474. 1984. SFA 30(1)
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[Dep. Zool. Comp. Physiol., The University, P.O. Box 363, Birmingham B15 2TT, England]

85-000743 Maier, K. J. GALLSTONE INDUCTION IN TILAPIA, *OREOCHROMIS MOSSAMBICUS* (PETERS). *J. Fish Dis.* 7(6):521-524. 1984. SFA 30(1)

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85-000744 Malhotra, S. K. CESTODE FAUNA OF HILL-STREAM FISHES IN GARHWAL HIMALAYAS, INDIA. II. *BOTHRIOCEPHALUS TELEOSTEI* N. SP. FROM *BARILIUS BOLA* AND *SCHIZOTHORAX RICHARDSONII*. *Bol. Chil. Parasitol.* 39(2):6-9. 1984. SFA 30(1)

[Parasitol. Lab., Dep. Zool., Univ. Garhwal, Srinagar, Garhwal 246 174, U.P., India]

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85-000746 Oliva M., M. and J. Carvajal G. *LOBATOSTOMA ANISOTREMUM* NEW SPECIES, (TREMATODA: ASPIDOGASTREA), PARASITIC IN THE TELEOST FISH *ANISOTREMUS SCAPULARIS* FROM CHILE. *Bull. Mar. Sci.* 35(2):195-199. 1984. SFA 30(1)

[Inst. Invest. Oceanol., Univ. Antofagasta, Casilla 1240, Antofagasta, Chile]

85-000747 Oliver, G. *MICROCOTYLE CHRYSOPHRII* VAN BENEDEN ET HESSE, 1863 (MONOGENEA, POLYOPISTHOCOTYLEA, *MICROCOTYLIDAE*) PARASITE DE *SPARUS AURATA* LINNAEUS, 1758 (TELEOSTEI, *SPARIDAE*) DANS LES ÉTANGS LITTORAUX DU LANGUEDOC-ROUSSILLON (FRANCE). [*MICROCOTYLE CHRYSOPHRII* VAN BENEDEN AND HESSE, 1863 (MONOGENEA, POLYOPISTHOCOTYLEA, *MICROCOTYLIDAE*) A GILL PARASITE OF *SPARUS AURATA* LINNAEUS, 1758 (TELEOSTEI, *SPARIDAE*) IN SOME COASTAL PONDS OF LANGUEDOC-ROUSSILLON.] *Bull. Soc. Zool. Fr.* 109(1):113-118. 1984. In French with English summ. SFA 30(1)

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OTHER DISEASES AND PARASITES (CONTINUED)

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- 85-000750 Sholdice, J. A. and D. B. McMillan. PITUITARY CYSTS IN THE SEA LAMPREY OF THE GREAT LAKES, *PETROMYZON MARINUS* L. *Gen. Comp. Endocrinol.* 57(1):135-149. 1985. SFA 30(1)
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- 85-000751 Speed, P. and G. B. Pauley. THE SUSCEPTIBILITY OF FOUR SALMONID SPECIES TO THE EYEFLUKE, *DIPLOSTOMUM SPATHACEUM*. *Northwest Sci.* 58(4):312-316. 1984. SFA 30(1)
[Wash. Coop. Fish. Res. Unit, Coll. Ocean Fish. Sci., Univ. Wash., Seattle 98195] Susceptibility to *Diplostomum spathaceum* differed significantly (t-test, $p=0.05$) among rainbow trout (*Salmo gairdneri*), cutthroat trout (*Salmo clarki*), brook trout (*Salvelinus fontinalis*), and coho salmon (*Oncorhynchus kisutch*) in terms of mean survival times after exposure to orally administered cercariae. Generally, rainbow trout were the most resistant while coho salmon were the least resistant. Increased survival time of fish apparently was directly related to increased water temperature, while survival time was inversely related to dosage of cercariae administered or duration of exposure to cercariae.
- 85-000752 Taraschewski, H. HETEROPHYIASIS, AN INTESTINAL FLUKE INFECTION OF MAN AND VERTEBRATES TRANSMITTED BY EURYHALINE GASTROPODS AND FISH. *Helgol. Meeresunters.* 37(1-4):463-478. 1984. SFA 30(1)
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[Peabody Mus. Nat. Hist., Yale Univ., New Haven, CT 06511]
- 85-000754 Threlfall, W. and J. Carvajal. *HELICONEMA PSAMMOBATIDUS* SP. N. (NEMATODA: PHYSALOPTERIDAE) FROM A SKATE, *PSAMMOBATIS LIMA* (CHONDRICHTHYES: RAJIDAE), TAKEN IN CHILE. *Proc. Helminthol. Soc. Wash.* 51(2):208-211. 1984. SFA 30(1)
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- 85-000755 Williams, E. H., Jr. and W. A. Rogers. *POMPHORHYNCHUS LUCYI* SP. N. (ACANTHOCEPHALA) FROM FRESH AND BRACKISH WATER FISHES OF THE SOUTHEASTERN U.S. GULF COAST. *J. Parasitol.* 70(4):580-583. 1984. SFA 30(1)
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- 85-000756 Zander, C. D.; H. G. Kollra, B. Antholz, W. Meyer and D. Westphal. SMALL-SIZED EURYHALINE FISH AS INTERMEDIATE HOSTS OF THE DIGENETIC TREMATODE *CRYPTOCOTYLE CONCAVUM*. *Helgol. Meeresunters.* 37(1-4):433-443. 1984. SFA 30(1)
[Zool. Inst., Martin-Luther-King-Platz 3, D-2000 Hamburg 13, West Germany]

POLLUTION

85-000757 Boon, J. P.; R. C. H. M. Oudejans and J. C. Duinker. KINETICS OF INDIVIDUAL POLYCHLORINATED BIPHENYL (PCB) COMPONENTS IN JUVENILE SOLE (*SOLEA SOLEA*) IN RELATION TO THEIR CONCENTRATIONS IN FOOD AND TO LIPID METABOLISM. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 79(1):131-142. 1984. SFA 30(1)

[Neth. Inst. Sea Res., P.O. Box 59, 1790 AB Den Burg, Texel, Netherlands]

85-000758 Colt, J. SEASONAL CHANGES IN DISSOLVED-GAS SUPERSATURATION IN THE SACRAMENTO RIVER AND POSSIBLE EFFECTS ON STRIPED BASS. *Trans. Am. Fish. Soc.* 113(5):655-665. 1984. SFA 30(1)

[Teufel and Assoc., 1303 Lake Blvd., Davis, CA 95616]

85-000759 Fraser, J. A. L. and E. R. Clark. THE EFFECTS OF A SETTLED INDUSTRIAL DOMESTIC SEWAGE WORKS EFFLUENT FROM PERCOLATING FILTERS ON THE EMBRYO VIABILITY AND HATCHING SUCCESS OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 25(4):393-403. 1984. SFA 30(1)

[Techno-Commercial Dep., Interlox Chem. Ltd., Baronet Rd., Warrington, Cheshire W4A 6HB, U.K.] The mortalities of washed and unwashed rainbow trout embryos exposed to Birmingham tap water, 50% and 100% settled effluent from filter beds has been compared. Differences in the hatching success between washed and unwashed embryos in the three treatments were also compared and the effect of saprophytic microbial growths assessed. There was a significant difference in mortality between washed embryos exposed to tap water (5%) and 50% effluent (12%) and 100% effluent (12%) when dissolved oxygen levels were maintained near 100% air saturation value. Mortalities of unwashed embryos were 4%, 26%, and 26% respectively for the three treatments. Hatching success of washed embryos was similar in the three treatments but unwashed embryos were significantly affected by the effluent treatments because of *Sphaerotilus* growths.

85-000760 Gluth, G. and W. Hanke. A COMPARISON OF PHYSIOLOGICAL CHANGES IN CARP, *CYPRINUS CARPIO*, INDUCED BY SEVERAL POLLUTANTS AT SUBLETHAL CONCENTRATION--II. THE DEPENDENCY OF THE TEMPERATURE. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 79(1):39-45. 1984. SFA 30(1)

[Dep. Zool., The University, D-7500 Karlsruhe, West Germany] Carp were exposed to 10 different pollutants with sublethal concentrations at 12, 17 or 22°C. The effects on the serum cortisol and glucose levels, the amount of liver and muscle glycogen and the concentration of protein and cholesterol in the serum were examined. The level of serum cortisol and glucose increased, the amount of liver and muscle glycogen decreased and the protein and cholesterol concentration were reduced after exposure to the pollutants. The cortisol and glucose response was similar at all temperatures, slightly reduced at 17°C. The glycogen reaction was strongest at 17°C and the protein and cholesterol response was low at 12°C and increased with the temperature. The explanation of the different temperature dependency is difficult. Carp are stressed and have low metabolic rate at 12°C. They have good conditions at 17°C and have a higher energy demand at 22°C. These simple differences cannot exactly explain the different dependency.

85-000761 Haines, T. A. and J. J. Akielaszek. EFFECTS OF ACIDIC PRECIPITATION ON ATLANTIC SALMON RIVERS IN NEW ENGLAND. *U.S. Fish Wildl. Serv. FWS/OBS-80/40.18.* xi+108p. 1984. SFA 30(1)

[USEWS, Columbia Natl. Fish. Res. Lab., Field Res. Stn., Zool. Dept., Univ. Me., Orono 04469]

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POLLUTION (CONTINUED)

85-000762 Hubert, W. A.; E. D. Ricca and J. J. Richard. VARIATION IN POLYCHLORINATED BIPHENYL LEVELS IN COMMON CARP FROM A PRIMARILY AGRICULTURAL DRAINAGE. *Hydrobiologia* 118(3):293-297. 1984. SFA 30(1)
[Wyo. Coop. Fish. Res. Unit, Univ. Wyo., Laramie]

85-000763 Janssen, J. and J. P. Giesy. A THERMAL EFFLUENT AS A SPORADIC CORNUCOPIA: EFFECTS ON FISH AND ZOOPLANKTON. *Environ. Biol. Fishes* 11(3):191-203. 1984. SFA 30(1)

[Biol. Dep., Loyola Univ., 6525 N. Sheridan Rd., Chicago, IL 60626] We report effects of a thermal effluent on fish and zooplankton in an impoundment in South Carolina. The effects are not directly due to heated effluent but are indirect effects on the trophic dynamics of the system and depend on the physical structure of the system, season, and geography. As effluent from a nuclear reactor cooling pond (Pond C) enters the larger Par Pond it sporadically carries with it zooplankton and/or dead fish. Pond C produces high zooplankton densities in two situations: (1) high and hot effluent flow during cold winter weather; and (2) low (cool) effluent flow during warmer seasons. High zooplankton densities attract blueback herring, *Alosa aestivalis*, which attract largemouth bass, *Micropterus salmoides*. Dying and dead bluegills, *Lepomis macrochirus* from Pond C (heat killed) are eaten by Par Pond bass which swim into effluent temperatures as high as 46°C to take these easy prey. Blueback herring and largemouth bass distribution are affected by the presence of food rather than by temperature. Par Pond blueback herring appear to be available to bass mainly when herring are near the effluent from Pond C and when they spawn in spring in the littoral zone. Because blueback herring in Par Pond live only one year and because their presence in bass habitat is seasonal there is a strong seasonal component to bass food abundance. A previously reported annual oscillation in bass condition (K), with a peak in winter, occurs throughout Par Pond but is extreme in the vicinity of the effluent. The strong seasonality of food abundance for bass at the effluent correlates the winter peak in bass condition.

85-000764 Kellogg, R. L.; R. J. Ligotino and S. M. Jinks. THERMAL MORTALITY PREDICTION EQUATIONS FOR ENTRAINABLE STRIPED BASS. *Trans. Am. Fish. Soc.* 113(6):794-802. 1984. SFA 30(1)

[N.C. State Univ., Dep. Econ. Bus., Box 5368, Raleigh 27607]

85-000765 Kunkle, S.; R. Nickerson and G. M. Smillie. METAL CONCENTRATIONS IN FISH AT CURECANTI NATIONAL RECREATION AREA, GUNNISON, COLORADO. *Natl. Park Serv. Water Resour. Field Support Lab. Proj Rep. No. 83-3-P. iii+33p.* 1983. SFA 30(1)

[Water Resour. Field Support Lab., Natl. Park Serv., Colo. State Univ., Fort Collins 80523]

85-000766 LaZerte, B. D. and P. J. Dillon. RELATIVE IMPORTANCE OF ANTHROPOGENIC VERSUS NATURAL SOURCES OF ACIDITY IN LAKES AND STREAMS OF CENTRAL ONTARIO. *Can. J. Fish. Aquatic Sci.* 41(11):1664-1677. 1984. In English with French summ. SFA 30(1)

[Dorset Res. Cent., Ontario Minist. Environ., P.O. Box 39, Dorset, ON POA 1E0, Canada]

85-000767 Mayer, K. S.; E. Multer and R. K. Schreiber. ACID RAIN: EFFECTS ON FISH AND WILDLIFE. *U.S. Fish. Wildl. Serv. Fish Wildl. Leaflet* 1. 9p. 1984. SFA 30(1)

[Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201]

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85-000768 Ogata, M.; K. Fujisawa; Y. Ogino and E. Mano. PARTITION COEFFICIENTS AS A MEASURE OF BIOCONCENTRATION POTENTIAL OF CRUDE OIL COMPOUNDS IN FISH AND SHELLFISH. *Bull. Environ. Contam. Toxicol.* 33(5):561-567. 1984. SFA 30(1)

[Dep. Publ. Health, Okayama Univ. Med. Sch., 2-5-1 Shikatacho, Okayama City 700, Japan]

85-000769 Skare, J. U.; J. Stenersen, N. Kveseth and A. Polder. TIME TRENDS OF ORGANOCHLORINE CHEMICAL RESIDUES IN SEVEN SEDENTARY MARINE FISH SPECIES FROM A NORWEGIAN FJORD DURING THE PERIOD 1972-1982. *Arch. Environ. Contamin. Toxicol.* 14(1):33-41. 1985. SFA 30(1)

[Norwegian Coll. Vet. Med., Dep. Pharmacol. Toxicol., P.O. Box 8146, Oslo, Norway]

TOXICOLOGY; BIOASSAYS

85-000770 Benson, W. H. HEAVY METAL TOLERANCE AND METALLOTHIONEIN INDUCTION IN FATHEAD MINNOWS: RESULTS FROM FIELD AND LABORATORY INVESTIGATIONS. *Ph.D. dissertation, Univ. Ky.* 137p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(4):1090. 1984. SFA 30(1)

The results support the conclusion that fathead minnows develop increased tolerance to cadmium and copper following prolonged sublethal exposure to these metals, and that this metal-induced tolerance is not sustained once organisms are removed from toxicant stress. As determined in correlated biochemical studies, gill metallothionein concentrations correlated closely with the variations in tolerance exhibited during cadmium acclimation and deacclimation. Therefore, tolerance induction was attributed to increased production of metallothionein, a protein which selectively binds and sequesters cadmium, copper and certain other metals.

85-000771 Boese, B. L. UPTAKE EFFICIENCY OF THE GILLS OF ENGLISH SOLE (*PAROPHRYS VETULUS*) FOR FOUR PHTHALATE ESTERS. *Can. J. Fish. Aquatic Sci.* 41(11):1713-1718. 1984. In English with French summ. SFA 30(1)

[U.S. EPA, Corvallis Environ. Res. Lab., Mar. Sci. Cent., Newport, OR 97365]

85-000772 Brooks, A. S. and J. M. Bartos. EFFECTS OF FREE AND COMBINED CHLORINE AND EXPOSURE DURATION ON RAINBOW TROUT, CHANNEL CATFISH, AND EMERALD SHINERS. *Trans. Am. Fish. Soc.* 113(6):786-793. 1984. SFA 30(1)

[Dep. Biol. Sci., Univ. Wis., Milwaukee 53201]

85-000773 Burton, D., M. P. Burton and D. R. Idler. EPIDERMAL CONDITION IN POST-SPAWNED WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (WALBAUM), MAINTAINED IN THE LABORATORY AND AFTER EXPOSURE TO CRUDE PETROLEUM. *J. Fish Biol.* 25(5):593-606. 1984. SFA 30(1)

[Mar. Sci. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

85-000774 Carrasco, S.; H. Sumano and R. Navarro-Fierro. THE USE OF LIDOCAINE-SODIUM BICARBONATE AS ANAESTHETIC IN FISH. *Aquaculture* 41(4):395-398. 1984. SFA 30(1)

[Dep. Physiol., Fac. Vet. Med., Univ. Mexico, 20 D.F.C.P. 04340, Mexico] Lidocaine and lidocaine-sodium bicarbonate mixture were evaluated as anaesthetics for carp (*Cyprinus carpio*), catfish (*Ictalurus*

SPORT FISHERY ABSTRACTS

TOXICOLOGY; BIOASSAYS (CONTINUED)

85-000774 CONTINUED *punctatus*) and tilapia (*Tilapia mossambica* = *Oreochromis mossambicus*). Although both induced anaesthesia, the mixture was more effective for induction and recovery, and was able to achieve the required time for the fish to be out of water. The responses varied for the three test species.

85-000775 Collodi, P.; M. S. Stekoll and S. D. Rice. HEPATIC ARYL HYDROCARBON HYDROXYLASE ACTIVITIES IN COHO SALMON (*ONCORHYNCHUS KISUTCH*) EXPOSED TO PETROLEUM HYDROCARBONS. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 79(2):337-341. 1984. SFA 30(1)

[Dep. Biol. Sci., Univ. Pittsburgh, Pittsburgh, PA 15260]

85-000776 Dave, G. EFFECT OF pH ON PENTACHLOROPHENOL TOXICITY TO EMBRYOS AND LARVAE OF ZEBRAFISH (*BRACHYDANIO RERIO*). *Bull. Environ. Contam. Toxicol.* 33(5):621-630. 1984. SFA 30(1)

[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, 400 31 Göteborg, Sweden]

85-000777 Felts, P. A. and A. G. Heath. INTERACTIONS OF TEMPERATURE AND SUBLETHAL ENVIRONMENTAL COPPER EXPOSURE ON THE ENERGY METABOLISM OF BLUEGILL, *LEPOMIS MACROCHIRUS* RAFINESQUE. *J. Fish Biol.* 25(4):445-453. 1984. SFA 30(1)

[Dep. Biol., VPI&SU, Blacksburg, VA 24061] Copper (0.21mg l^{-1}) caused a decrease in whole body oxygen consumption in bluegills exposed for 32 days, but no changes occurred during days 3, 4 or 9 of copper exposure. *In vitro* oxygen consumption of gill and brain, were not significantly altered, whereas liver QO_2 was slightly elevated which suggests that copper is acting to decrease oxygen consumption of the whole animal at a higher level of integration than these individual tissues. In fish subjected to an increase in temperature as well as sublethal copper exposure, whole body oxygen consumption was higher than controls 5 days after the temperature was increased, indicating a delay in temperature acclimation in the copper exposed fish. This difference was reflected in higher *in vitro* oxygen consumption in the liver and gill of these fish suggesting the metal was delaying the process of temperature acclimation by at least in part acting directly on the tissues.

85-000778 Gilbertson, M. NEED FOR DEVELOPMENT OF EPIDEMIOLOGY FOR CHEMICALLY INDUCED DISEASES IN FISH IN CANADA. *Can. J. Fish. Aquatic Sci.* 41(10):1534-1540. 1984. In English with French summ. SFA 30(1)

[Dep. Fish Oceans, Ottawa, ON K1A OE6, Canada]

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[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

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[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

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[Dep. Zool., K.L.D.A.V. Coll., Roorkee-247667, India] The acute toxicity tests were conducted with a molluscicide Bayer 73, a piscicide Antimycin A and a lampicide, 3-trifluoromethyl-4-nitrophenol (TFM) to a freshwater teleost *Lebistes reticulatus* (Peters) by static bioassay method. The experiments were conducted at 23 (22-24)°C and at pH 8.1 (7.9-8.3). The median lethal concentrations (LC_{50}), slope functions, median period of survival and the relative potency of the three toxicants were worked out for 12, 24, 48, 72 and 96 hr exposure. The 96 hr LC_{50} for Antimycin A in relation, Bayer 73 and TFM were 0.00114, 0.39 and 7.0 mg/l respectively. The median periods of survival increased with the decreasing concentrations. The relative potency of Bayer 73 and TFM Antimycin A were 354.545 and 6363.640 respectively at 96 hr exposure. The presumable harmless concentrations were 0.000049, 0.0294 and 0.4199 mg/l for Antimycin A, Bayer 73 and TFM respectively. The results thus indicate the rank order toxicity among the three chemicals as Antimycin A > Bayer 73 > TFM.

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[Dep. Pathol., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Rainbow trout fed prepared rations containing therapeutic levels of erythromycin (110 mg/kg daily) developed lesions in epithelial cells of the first proximal segment of the nephron. Pathological changes which developed within 24 h were characteristic of congestive overloading of lysosomes. Treated fish became anorexic within 2-3 weeks. Affected epithelial cells of fish after 14 days of anorexia contained residual bodies in an otherwise normal appearing cytoplasm. Cell injury was reversible. Since the onset of anorexia corresponded with the completion of the recommended treatment period and damaged cells repair rapidly, erythromycin should nevertheless be retained as the treatment of choice for bacterial kidney disease.

85-000784 Hose, J. E. and H. W. Puffer. OXYGEN CONSUMPTION RATES OF GRUNION (*LEURESTHES TENUIS*) EMBRYOS EXPOSED TO THE PETROLEUM HYDROCARBON, BENZO[a]PYRENE. *Environ. Res.* 35(2):413-420. 1984. SFA 30(1)

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85-000785 Hose, J. E.; J. B. Hannah; H. W. Puffer and M. L. Landolt. HISTOLOGIC AND SKELETAL ABNORMALITIES IN BENZO(A)PYRENE-TREATED RAINBOW TROUT ALEVINS. *Arch. Environ. Contam. Toxicol.* 13(6):675-684. 1984. SFA 30(1)

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85-000786 Hoskins, G. E. and F. C. Dalziel. SURVIVAL OF CHINOOK FRY (*ONCORHYNCHUS TSCAWYTSCHA*) FOLLOWING EXPOSURE TO BENZALKONIUM CHLORIDE IN SOFT WATER. *Prog. Fish-Cult.* 46(2):98-101. 1984. SFA 30(1)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

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[Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada]

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[Univ. Tex. Mar. Sci. Inst., Port Aransas]

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[Sch. Fish., Univ. Seattle, WH-10, Seattle, WA 98195]

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[Lake Superior Res. Unit, P.O. Box 130, Sault Ste Marie, ON P6A 5L5, Canada]

Juvenile smallmouth bass, *Micropterus dolomieu*, were starved over a period of 6 months in the laboratory and their survival in waters of low pH tested. The ability of the bass to withstand the toxic effects of hydrogen ion decreased with time. The LC50(96-h) changed from pH 3.7 to pH 4.4 over the experimental period. During the final days, the decrease in the threshold was greatly accelerated. In the wild, some overwintering bass are subjected to pulses of water as low as pH 4.7 as a result of vernal snowmelt. Bass at the end of winter are often emaciated and are especially susceptible to acid stress.

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[Trop. Dev. Res. Inst., Overseas Dev. Admin., College House, Wrights Lane, London W8 5SJ, England]

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[Course Nutr. Sci., Hakodate Jr. Coll., 173 Takaoka-cho, Hakodate 042, Japan]

85-000796 Morison, R. THE ACUTE SUBLETHAL EFFECTS OF THE PESTICIDES CARBARYL AND MALATHION ON PARTIAL ETHOGRAMS OF THE YELLOW BULLHEAD (*ICTALURUS NATALIS* (LESEUR)). *Ph.D. dissertation, Univ. Texas* 435p. 1984. From Diss. Abstr. Int. B Sci. Eng. 45(5):1368. 1984. SFA 30(1)

The dominant fish of pair colonies of adult yellow bullheads, *Ictalurus natalis* (Leseur) were acutely exposed (48 hours) to sublethal levels 1, 2, and 4 mg l⁻¹ of carbaryl and 1, 2, and 4 mg l⁻¹ malathion. The alternations of social behaviors in a partial ethogram (reproductive behaviors were excluded) were recorded and analyzed. Analyses of Variance and Multiple Criteria Analyses of transformed data demonstrated clear alterations of field substantiated social behaviors with both chemicals. Carbaryl altered abilities to maintain dominance temporarily and in some malathion exposed animals dominance was apparently not maintained over approximatedly 10 days, when compared with untreated yellow bullheads. An interference with feeding (ingestion) reactions by carbaryl was not accompanied by a corresponding inhibition of sensory ability in detecting food. Social behaviors in non-treated bullheads were generally "opposite" to the treated fish. Social behavior alterations provided more sensitive indications to toxicants than physiological reactions. The ethological methods employed revealed a level of damage and extent of risk to a species heretofore generally unappreciated. The exposure levels of these short-lived common pesticides were reasonably close to detected ambient levels in forecasted watersheds, estuaries and agrosystems. The implications of alterations of social behavior and structure on short-term adaptive ability of species are not known; however, these effects may be much more profound than acute large scale mortalities. The hypothesis that possible ambient environmental levels of two pesticides altered social behavior was substantiated.

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[Ariz. Coop. Fish. Res. Unit, Univ. Ariz., Tucson 85721]

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[U.S. EPA, 200 S.W. 35th Street, Corvallis, OR 97333]

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[Swedish Environ. Res. Inst., Box 21060, S-100 31 Stockholm, Sweden]

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[Aquatic Stn., Southwest Tex. State Univ., San Marcos 78666]

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[Inst. Gen. Genet., Acad. Sci. USSR, Moscow, USSR] Loach eggs were allowed to develop in strontium-90-yttrium-90 solutions with specific activity of $4 \cdot 10^{-10}$ and $4 \cdot 10^{-6}$ ci/l, with pH varying from 3.0 to 10.8. Accumulation of these radionuclides depends on the pH of the medium. A comparison of egg mortality during incubation was made which included proportion of deformed larvae, mitotic index and frequency of aberrant anatelophases in embryos developing in radionuclide solutions in the control, and with the amount of β particles penetrating the chromosome of embryonic cells during 1 hour. The results lead to the conclusion that the teratogenic effects observed are caused not from radiation induced mutations, but by the effects of pH.

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[S. D. Murphy: Dep. Environ. Health, SC-34, Univ. Wash., Sch. Publ. Health, Seattle, WA 98195]

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[P. Melius: Dep. Chem., Auburn Univ., Auburn, AL 36849]

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[Prod. Environ. Serv., Duke Power Co., Rt. 4, Box 531, Huntersville, NC 28078]

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[Dep. Biol., Med. Acad., 1 Debinki St., 80-211 Gdansk, Poland]

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[Dep. Ophthalmol., Univ. Rochester Sch. Med. Dent., 601 Elmwood Ave., Rochester, NY 14642]

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[Iowa Conserv. Comm., Chariton Res. Stn., R.R. 1, Box 209, Chariton 50049]

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[FAO of the UN, Rome, Italy]

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[Wyo. Game Fish. Dep., Rt. 2, Box 25, Laramie 82070]

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[P.O. Box 180, Jefferson City 65102-0180]

HABITAT ALTERATIONS

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[Minist. Environ., Fish Wildl. Br., Fish. Res. Sect., 2204 Main Mall, Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

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[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

HABITAT ALTERATIONS (CONTINUED)

85-000824 Crisp, D. T.; R. H. K. Mann and P. R. Cubby. EFFECTS OF IMPOUNDMENT UPON FISH POPULATIONS IN AFFERENT STREAMS AT COW GREEN RESERVIOR. *J. Appl. Ecol.* 21(3):739-756. 1984. SFA 30(1)

[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP, England] The numbers, growth, production and movement of brown trout (*Salmo trutta* L.) and bullhead (*Cottus gobio* L.) are described for the streams flowing into Cow Green reservoir after its impoundment, and comparisons are made with pre-impoundment results. There was no change in the mean length for age of trout, but there was a small, statistically significant, increase in that of bullheads. The population density of trout fry increased in most streams by 300-1100%, probably because of an increase in egg production through the immigration of large reservoir trout to spawn. There was a statistically significant ($P < 0.05$) increase in the instantaneous rate of loss of fish in most streams. In five afferent streams, trout production, from

August of the first year of life onwards, increased from $0.73\text{--}3.7\text{ g m}^{-2}\text{ year}^{-1}$ to $0.91\text{--}8.2\text{ g m}^{-2}\text{ year}^{-1}$ following impoundment, and there was an increase in the contribution of the 0 group. Bullhead production on Red Sike and Near Hole Sike was estimated at 1.08 and $1.86\text{ g m}^{-2}\text{ year}^{-1}$ respectively but there are no pre-impoundment results for comparison. Some reservoir trout moved into the afferent streams during the spawning run of mature fish. Recruitment to the upper reaches of most streams was largely through the upstream movement of trout from the nursery areas in the middle and lower zones. The numbers of bullheads in the lower reaches of most streams were erratic, but most adults overwintered and spawned in the reservoir and some moved into the streams during summer. Exceptions are Red Sike and Near Hole Sike in which resident spawning populations became established. A preponderance of males was found amongst the sexually mature trout resident in the afferent streams, but within the reservoir there was a preponderance of female trout.

85-000825 Platts, W. S. PROGRESS IN RANGE RIPARIAN-STREAMS RESEARCH AT THE INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION. In: *Proceedings of the Bonneville Chapter of the American Fisheries Society* p. 78-84, 1984. Available from USDA Forest Service, Intermountain Forest and Range Experiment Station, 507 25th Street, Ogden, Ut 84401. SFA 30(1)

Eight options are available for land managers to use in managing range riparian-stream habitats. These options vary from the elimination of grazing until recovery occurs, to complicated grazing strategies. Options with the best opportunity for maintaining and improving riparian-stream habitats are the inclusion of the riparian pasture, fencing streamside corridors, changing the kind of livestock, and adding more rest to the grazing cycle.

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[T. Lloyd Assoc., 9417 Meadowbrook Ave., Philadelphia, PA 19118]

85-000827 Tappel, K. C. NON-EXPLOSIVE DEMOLITION OF ROCK TO IMPROVE FISH HABITAT. *N. Am. J. Fish. Manage.* 4(4B):569-571. 1984. SFA 30(1)

[U.S. For. Serv., Tongass Natl. For., Fed. Bldg., Ketchikan, AK 99901]

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[Dep. Fish., 115 General Administration Bldg., Olympia, WA 98509]

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[Math. Sci. Dep., Ala. State Univ., Montgomery 36195]

85-000830 Hudgins, M. D. and W. D. Davies. PROBABILITY ANGLING: A RECREATIONAL FISHERY MANAGEMENT STRATEGY. *N. Am. J. Fish. Manage.* 4(4A):431-439. 1984. SFA 30(1)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849]

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[U.S. For. Serv., El Dorado Natl. For., 100 Forni Rd., Placerville, CA 95667]
Klamath River anglers were surveyed in the fall of 1979 to determine attitudes toward various aspects of a fishing experience. A questionnaire containing various items relating to personal characteristics and preference in an angling experience was administered to 257 anglers. Seven factors or reasons for a fishing trip were identified involving sensory feelings, act of fishing, escape, water closeness, catching fish, food source, and fishing alone. Results from the analysis of the identifying variables versus the factors indicated that anglers over 45 showed a preference for keeping fish for food and enjoyed the act of fishing. They showed little interest in being close to the water. People under 45 showed more interest in being near the water, but indicated little interest in the act of fishing and keeping fish as food. Eighty-five percent of the anglers surveyed were males. Males showed a great deal of interest toward the act of fishing, being close to water, and fishing alone. Females indicated that nature-related aspects were the most important in a fishing experience. Seventy-two percent of the anglers used spinning rods and reels, 23% used fly rods and fly reels, and 5% used open face casting reels and casting rods. Fly fishermen were interested in being close to the water while spin fishermen showed the most interest toward keeping fish as a food source. Results from the regulation questions indicated users of spinning and conventional tackle did not support reduced bag limits while fly fishermen indicated support for reduced harvest. A "flies-only" designation to some waters of the Klamath was supported by fly fishermen, while spin fishermen reacted negatively to the proposal. Removal of jet boats from Weitchpec to Happy Camp was supported by 72% of all anglers.

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85-000836 Paragamian, V. L. EVALUATION OF A 12.0-INCH MINIMUM LENGTH LIMIT ON SMALLMOUTH BASS IN THE MAQUOKETA RIVER, IOWA. *N. Am. J. Fish. Manage.* 4(4B):507-513. 1984. SFA 30(1)
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85-000838 Kirkwood, G. P. and M. H. Walker. A NEW METHOD FOR ESTIMATING TAG SHEDDING RATES, WITH APPLICATION TO DATA FOR AUSTRALIAN SALMON, *ARRIPIS TRUTTA ESPEL* WHITLEY. *Aust. J. Mar. Freshwater Res.* 35(5):601-606. 1984. SFA 30(1)
[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, N.S.W. 2230, Australia] A new procedure is described for estimation of tag shedding rates from a double-tagging experiment, when exact times of recapture are known. The method requires identical assumptions to existing procedures using recapture data pooled over time, but it avoids approximations inherent in those procedures. Estimates are obtained independently of the history of fishing and natural mortality throughout the experiment. The procedure was developed principally to handle those situations in which the pooled data methods are unsuitable, due to sensitivity of the estimates to the pooling interval adopted. This commonly occurs when recaptures are few and irregularly spaced over time. Use of the procedure is illustrated with data for adult Australian salmon, *A. trutta espel*, which were tagged with single and double internal tags of two sizes in March 1978. No difference was found between the recovery rates of the two tag types. Of 125 originally double-tagged fish, 47 were recovered and 41 of these retained both tags on recovery. An annual tag retention of 74.5% was estimated, with 95% confidence limits 52.1-89.6%.

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[Dep. Zool., Univ. Aberdeen, Aberdeen AB9 2TN, Scotland] The effects of externally mounted ultrasonic tags on the tail beat frequency (TBF) and opercular beat rate (OBR) of rainbow trout was measured at different swimming speeds. The increase in relative drag caused by the tags was also measured. Two tag types were used: one where both the circuitry and the battery were in a single package mounted on one side of the fish, the other where they were in two packages mounted symmetrically on either side of the fish. Both tag types raised both TBF and OBR. Of the two, the symmetrical tag effects behaviour less, especially at low swimming speeds, even though it causes a greater increase in relative drag.

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85-000843 Thrower, F. P. and W. W. Smoker. FIRST ADULT RETURN OF PINK SALMON TAGGED AS EMERGENTS WITH BINARY-CODED WIRES. *Trans. Am. Fish. Soc.* 113(6):803-804. 1984. SFA 30(1)
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STOCKING AND INTRODUCTIONS

85-000844 Bailey, J. K. and R. L. Saunders. RETURN OF THREE YEAR-CLASSES OF SEA-RANCHED ATLANTIC SALMON OF VARIOUS RIVER STRAINS AND STRAIN CROSSES. *Aquaculture* 41(3):259-270. 1984. SFA 30(1)

[Huntsman Mar. Lab., St. Andrews, NB E0G 2X0, Canada] Releases and returns of three year-classes of sea-ranched Atlantic salmon, *Salmo salar*, of several river strains and strain crosses were examined. Significant ($P < 0.05$) year-class and strain effects were found for fork length, day of return, and percent return among grilse and larger salmon and for the percentage of grilse among the returns. In addition, contrasts among pure strains, sire strains, and dam strains were made. Grilse of the Big Salmon River strain and crosses involving the Big Salmon River strain tended to be longest, return latest, and had the highest percent returns. Larger salmon of the Saint John River strain and strain crosses tended to be longest and had the highest percent return. The Big Salmon River and Rocky Brook strains produced higher proportions of grilse than either the Magaguadavic or Saint John River strains. There was no evidence of heterosis from crosses between strains for any of the traits examined. Sire strain means were more similar to pure strain means than were dam strain means. Pseudolinkage in the males is proposed as a possible explanation. Recommendations are made for choosing stocks which are appropriate for sea ranching.

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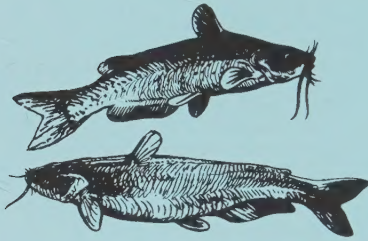
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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



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